



NEW HAMPSHIRE ENVIRONMENT 2001



NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES



Jeanne Shaheen
Governor

Executive Council

Raymond S. Burton

Ruth L. Griffin

Peter J. Spaulding

David K. Wheeler

Raymond J. Wieczorek

Front cover: *The Merrimack River as it flows
through Concord.*



NEW HAMPSHIRE ENVIRONMENT 2001

Prepared by
New Hampshire Department of Environmental Services

October 2002

George Dana Bisbee, *Acting Commissioner*
Philip J. O'Brien, Ph.D., *Director, Waste Management Division*
Robert Scott, *Acting Director, Air Resources Division*
Harry T. Stewart, P.E., *Director, Water Division*

A Message from the Governor



New Hampshire's beautiful environment—from our lakes and rivers, to our forests and farms, to our mountains and sea-coast—enriches all of our lives. Our natural environment attracts tens of thousands of visitors every year who pour billions into our state's economy; attracts new companies and good-paying jobs; and is why many of us choose to live in the Granite State.

As a state, we are working to protect our environment in order to strengthen our economy, safeguard the health of our citizens, and to preserve our special quality of life. *New Hampshire Environment 2001* outlines some of the steps we have taken in the last year to protect our state's natural environment for our citizens today and their children tomorrow.

I fought for and signed a law making New Hampshire the first state in the nation to legislate a reduction in power plant emissions of four pollutants: carbon dioxide, sulfur dioxides, nitrogen oxides and ultimately, mercury.

We preserved 171,000 acres of New Hampshire wilderness. The land, formerly owned by International Paper, has long been a special place for New Hampshire families and visitors, as well as an economic engine for the North Country and the State of New Hampshire. Through a joint effort of the state, environmental organizations, the local communities, and the federal government, we have guaranteed that these lands will always be open for families to enjoy for hiking, fishing or hunting; protected critical wildlife habitats; and preserved the jobs of North Country loggers.

We acted to protect our water supplies. I proposed and signed into law legislation to protect and conserve our precious water supplies as our state's population grows. These new laws require water utilities to put in place common-sense water conservation measures; encourage regional cooperation on water issues; and allow us to protect our water supplies in an emergency.

In addition, we continue to make great progress on a number of our ongoing efforts to improve and protect New Hampshire's environment. For example, in 1999 we set a goal of cutting New Hampshire's mercury emissions in half by 2003. We have already reduced emissions by 45 percent, and we're on track to meet and surpass our 50 percent goal by 2003.

We all have a responsibility in protecting our state's environment. I invite you to read *New Hampshire Environment 2001* to learn more about what efforts are already underway, and urge you to take an active role as a steward of our state's natural resources.

A handwritten signature in black ink that reads "Jeanne Shaheen". The signature is fluid and cursive, with a long, sweeping line for the "S" in "Shaheen".

Jeanne Shaheen
Governor

Table of Contents

Introduction from the Commissioner	1
Protecting New Hampshire's Air Quality	2
Waste Management and Site Cleanup	12
Protecting Water Quality	21
N.H. Geological Survey Formally Created	33
Volunteer Opportunities at DES	34
Environmental Dollars at Work	35
Credits & Acknowledgments	36

Introduction

from the Commissioner's Office



I am pleased to release the Department of Environmental Services' annual report on environmental progress in New Hampshire and some of the environmental challenges facing our state. We have developed this report for the dual purpose of providing a snapshot of the quality of New Hampshire's environment, as well as a summary of significant accomplishments in the last year.

New Hampshire rightly prides itself on the quality of its environment, and in *New Hampshire Environment 2001* we see evidence of continuing improvement in air and water quality. From improving water quality in the Lamprey River, to making substantial reductions in mercury emissions, to cleaning up more and more leaking underground storage tank sites, the State of New Hampshire, its citizens, and its businesses continue to take important steps towards improving environmental quality. We also witnessed in 2001 important initiatives like the Clean Power Strategy to provide substantial further reductions of SO₂, NO_x, mercury, and carbon dioxide, and the continuing implementation of the water supply land conservation grants program, which offers state financial incentives through a 25 percent matching grant program for communities to purchase land and easements to protect crucial public water supplies.

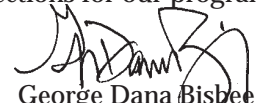
Once again, New Hampshire demonstrated the ability to accomplish improvements in environmental quality through innovative and voluntary actions. I thank the marine dealers who voluntarily entered into—and carried out very successfully—the Clean Marine Engine Initiative, which accelerates the sale and use of low-pollution outboard marine engines in New Hampshire. Similarly, Groveton Paper Board Inc. worked with DES to find an innovative and far less costly way to make required reductions in metha-

nol emissions by implementing a change in its wastewater treatment process.

New Hampshire Environment 2001 also points to continuing challenges that we have yet to meet fully. We must continue to reduce instances of violations of the health-based ozone standard and to reduce emissions of air toxics. The recycling rate in New Hampshire has become stagnant, and we must pursue new approaches to reduce the amount of waste—and the toxicity of the waste—that we are disposing of in New Hampshire. Also, the severity and duration of the current drought conditions have reminded us all of the growing need to deal with the pressures on the availability of clean water for our citizens.

As I write this, DES is embarking on an ambitious strategic planning effort. Though we do not set the environmental agenda for the State of New Hampshire, we recognize our responsibility to serve as a catalyst to bring together all of our stakeholders and the State's policymakers to help craft a continuing plan of action to deal with the environmental challenges facing us. Our goal as a department is to work with our stakeholders to fashion a strategic direction, and continue to report openly on New Hampshire's environment and environmental programs. This effort will be driven in large part by high quality data, so it is vital that we continue to expand our data-gathering capabilities, and, equally important, to refine the environmental performance measures that guide our future direction.

In this effort and in all of our endeavors, we invite your active engagement with us. We commend the countless number of people across our state whose efforts, both large and small, have helped to maintain and improve the environmental conditions and make New Hampshire so special. And we invite your further insights and assistance as we develop and implement future directions for our programs.



George Dana Bisbee
Acting Commissioner

Protecting New Hampshire's Air Quality

Much progress has been made in recent decades to tackle air quality issues in New Hampshire and across the country. Focus has been placed on large, stationary sources of air pollution—power plants, paper mills and manufacturing facilities—and, as a result, these sources have implemented measures to significantly reduce their emissions.

Though large facilities are still a focus of attention, major challenges facing New Hampshire today arise from a number of small sources as well. These include motor vehicles, households, and small- to medium-sized businesses that continue to emit air pollutants. Collectively, these smaller sources add significant pollution to the atmosphere, which in turn contributes to air quality problems such as smog, regional haze, acid deposition, global climate change, and localized elevated levels of toxic air pollutants.

Recognizing these complex issues, DES has worked with stakeholders to develop various strategies to further reduce emissions of air pollutants and maximize benefits quickly and cost-effectively. Recognizing also that much of New Hampshire's air pollution originates in other states and is transported into our region by prevailing air currents, DES participates in regional and national air pollution forums. This "transport" issue underscores the need to address air quality problems from a broader perspective in order to reach collaborative solutions that will benefit New Hampshire and others.

AIR MONITORING

New Hampshire has monitored ambient (outdoor) air quality since the early 1960s through a statewide network of air monitoring stations. Over the past four decades, DES has ex-



A network of DES air monitoring stations across the state continually gather data used to measure important air quality parameters like ozone levels. Above, DES Air Resources Technician Jim Poisson checks the instruments at a new, state-of-the-art monitoring station in Manchester.

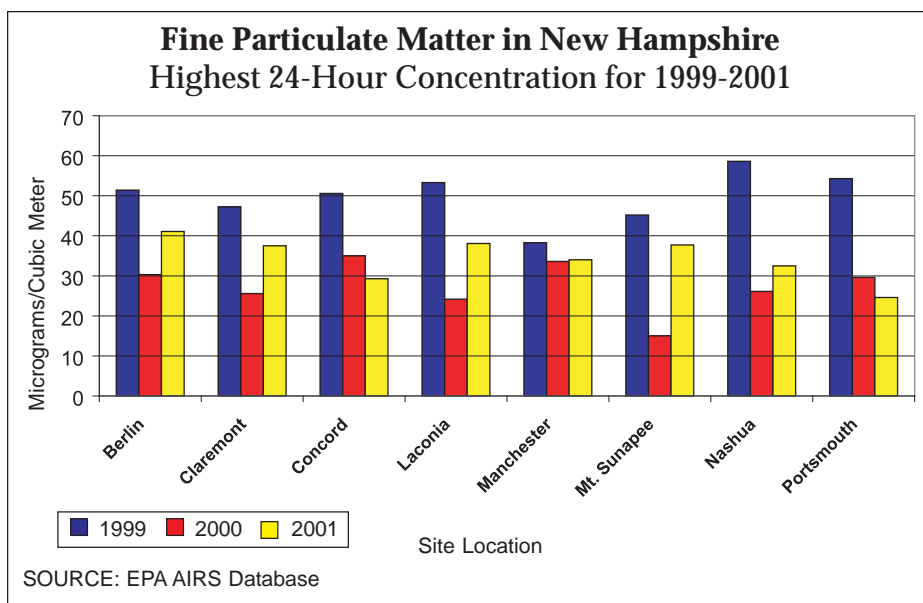


A clear springtime sky over New Hampshire's Mt. Washington Valley.

panded and enhanced this network to comply with federal requirements and to improve tracking of air quality throughout the state. The ambient air-monitoring network now includes over 25 different site locations, which measure and track numerous air pollutants, including ozone, particulate matter, sulfur dioxide, nitrogen oxides, carbon monoxide, air toxics, and mercury. Meteorological data such as wind speed, wind direction, and temperature is also collected at most of these sites. DES and other organizations use air-monitoring data to determine the status of New Hampshire's air quality, to predict air pollution episodes, to enact protective measures and warnings, and to protect the natural environment.

PARTICULATE MATTER

One pollutant of major concern in New Hampshire is particulate matter (PM), a term that refers to a variety of tiny particles suspended in the air, including soot, ashes, windblown dirt, sand, soil dust, metals, and even pollen. The particles may be solid or liquid, come in a wide range of sizes, and originate from both local and distant sources. Some particles are large enough to be seen as dust or smoke. Others are so small they can only be identified with an electron microscope. Particles smaller than 2.5 microns (millionths of a meter) in diameter are referred to as "fine particulate matter"; larger particles are called "coarse" particles.



The U.S. EPA standard for fine particulate matter, set in 1997, is 65 micrograms per cubic meter for 24-hour concentrations.

PM may be released directly into the air by a source, or formed in the atmosphere from such gases as sulfur dioxide, nitrogen oxides, and volatile organic compounds as a result of chemical and physical reactions. While some PM occurs naturally (e.g., crustal dust), fine PM typically results from fossil fuel combustion by motor vehicles, power plants, and industrial, commercial, and residential facilities. High particulate emissions also result from incomplete and inefficient wood burning in woodstoves and fireplaces, which are largely uncontrolled in New Hampshire.

PM from motor vehicles comes from exhaust emissions and tire and brake wear, with diesel powered vehicles and equipment being responsible for the majority of the PM emissions from the motor vehicle sector. Virtually all the PM emissions from diesels (carbon, soot, hydrocarbons, sulfates, ash, engine wear metals, and water) fall into the fine particle range.

The public health and environmental effects of particulate matter are dependent upon particle size and concentration in the ambient air. In response to increased concerns over the adverse health and environmental impacts of fine PM, DES has increased efforts over the past few years to monitor fine PM in the air and to upgrade existing monitoring stations.

Health Effects of Particulate Matter

Health risks from an inhaled dose of PM are directly related to the size and concentration of the particles. Nasal passages and upper branches of the human respiratory system are designed to protect the lungs from the larger coarse particles that exist in the atmosphere. However, fine particles under 2.5 microns in diameter travel to the deeper regions of the lungs where they settle

and induce or aggravate respiratory illness.

Scientific studies have linked exposure to fine particulate matter with significant adverse human health effects. The elderly, individuals with pre-existing heart or lung disease, and children appear to be most sensitive to the effects of PM. Children, who breathe 50 percent more air per pound of body weight than adults, are highly sensitive to exposure to fine particles. Their developing respiratory systems can be impacted by the deposition of these particles. Fine particles are associated with increased frequency of childhood illnesses, asthma, reduced lung function, aggravated coughing, and difficulty or pain in breathing.

Regional Haze

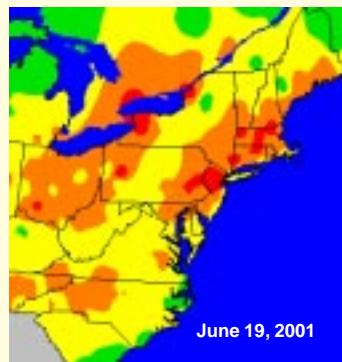
Particulate matter is also a major cause of visibility impairment in many regions of the United States, referred to as regional haze. Poor visibility occurs as a result of the scattering and absorption of light by particles and gases in the atmosphere. Haze limits the distance that one can see and obscures the clarity, color, texture, and form of what is seen, including our beautiful mountain vistas here in New Hampshire. Fine particles are more efficient at scattering light than coarse particles because their size is small enough to disturb the wavelengths of visible light, thus altering its path.

The fine particles principally responsible for visibility impairment are sulfates, nitrates, organic matter, elemental carbon (soot), and soil dust. During high relative humidity conditions, sulfates, nitrates, and some organics can accumulate water, increase in size, and actually become more efficient at scattering light and creating haze. Sulfates, primarily from fossil fuel burning, by this mechanism play a major role in poor visibility during the humid summer months in the eastern United States, and this can have a significant economic impact on tourism.

In response to EPA regulations aimed at protecting visibility in national parks and wilderness areas, states have established goals to improve and ensure visibility over the next 60 years. New Hampshire is currently working with states in the Northeast and mid-Atlantic regions to develop regional haze plans aimed at achieving these visibility goals in the wilderness areas of the White Mountain National Forest.

OZONE

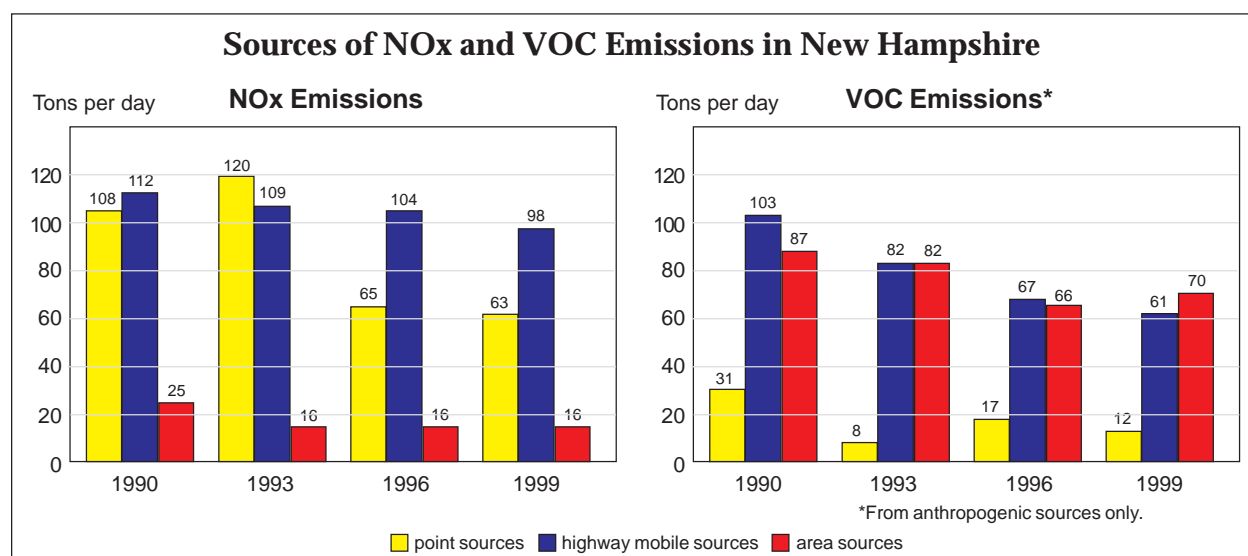
Ozone has been described as “good up high, bad nearby.” Stratospheric ozone in the upper atmosphere protects us from the sun’s harmful ultraviolet rays; however, tropospheric ozone, or ground-level smog, is considered a harmful air pollutant. Ground-level ozone forms during the summertime when nitrogen oxides (NOx) and volatile organic



OZONE MAPPING

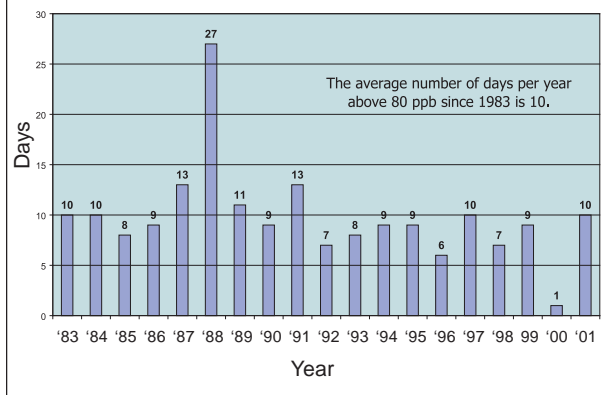
Ozone levels are affected by wind speed, wind direction, temperature, and cloud cover. Prevailing winds frequently carry ozone over large distances. Ozone mapping, now available to the public at www.epa.gov/airnow, shows the formation and movement of ozone (red, orange, and yellow areas above) on hot summer days and enables forecasting of ozone conditions.

New Hampshire is an active participant in the Ozone Transport Commission (OTC) and works with other states to develop consistent policies and rules across the Northeast and Mid-Atlantic states. Ozone-reducing measures proposed by the OTC also have the benefit of reducing the same pollutants that cause acid deposition, mercury deposition, air toxics, fine particles, and regional haze.



Nitrogen oxides (NOx) and volatile organic compounds (VOCs) are the pollutants that combine to form ground-level ozone. Source: DES Emissions Inventory Data.

N.H. Days with Ozone Levels Exceeding the Federal Health Standard of 80 parts per billion (8-Hour Average) 1983-2001



The trend in the number of exceedance days shows a slight decline in the 1990s, compared to the 1980s. However, further reductions in ozone-producing compounds will be needed to better protect the public.

compounds (VOCs) react chemically with oxygen in the presence of heat and strong sunlight. NO_x results from the burning of fuels in power plants, gasoline-powered motor vehicles, and major industrial facilities, and VOCs are emitted by motor vehicles, trees, gasoline, and other consumer products such as paints and solvents.

Like particulate matter, ground-level ozone is harmful to human health. Symptoms of ozone exposure include coughing, wheezing, chest tightness or pain when inhaling deeply, shortness of breath, and irritation of the respiratory system. Effects are more acute in active young children, whose lungs are still developing, and in people with respiratory diseases such as asthma, emphysema, or bronchitis. Even healthy individuals may experience mild symptoms of lung irritation at higher ozone levels. Ozone is also harmful to trees and vegetation.

New Hampshire monitors ozone levels statewide to determine compliance with the federal one-hour and future eight-hour health-based standards. Elevated levels of ground-level ozone are typically found in southern New Hampshire, especially along the seacoast, and tend to be the highest during the afternoon and early evening hours. High ozone levels are normally associated with high temperatures

(normally near or above 90°F) and winds coming from the southwest. In 2001, the one-hour ozone standard was exceeded on two days, and the 8-hour ozone standard was exceeded on ten days. Though this was significantly more than the previous year, based on long-term trends it is typical.

In an effort to protect public health and promote cleaner air, New Hampshire state officials announce “Air Quality Action Days” on those days when air pollution concentrations are expected to reach unhealthy levels. Individuals in affected regions are advised to take precautions to protect their health and avoid strenuous or prolonged outdoor activity.

For daily air quality forecasts during ozone season (May through September), DES maintains an Air Quality Information Line at 1-800-935-SMOG and a website at www.des.state.nh.us/ard/ozone.

PERSISTENT BIOACCUMULATIVE TOXICS

Persistent bioaccumulative toxics, or PBTs, are a class of chemicals that are generally emitted into the environment at very low levels. However, they are extremely toxic, break down very slowly, can be transported long distances from where they are emitted, and build up in the food chain and the environment over time. PBTs have been linked to a wide variety of health effects, including cancer, reproductive and developmental problems, endocrine system disruption, and negative effects on the immune system. Over the past few years, DES has focused on two PBTs, mercury and dioxin, which have significant public health implications for New Hampshire.

Mercury

Mercury is a naturally-occurring element that is primarily released into the air from various sources, then deposited onto the ground and into rivers and lakes. Once there, the mercury is taken up by plants and passed up the food chain to fish, animals, and eventually people. In an effort to identify the sources and reduce emissions of mercury in New Hampshire’s environment, DES released the *New Hampshire Mercury Reduction Strategy* in 1998. The Strategy set a goal of reducing emissions of mercury from New Hampshire sources by 50 percent by 2003 and recommends 40 action items to achieve this goal. Since the release

of the Strategy, many of these action items have been implemented, resulting in a 45 percent reduction in mercury emissions as of 2001, and with on-going mercury reduction efforts now underway, an expected reduction of over 55 percent by 2003.

Dioxin

“Dioxin” refers to a group of compounds that share similar chemical characteristics and common mechanisms of toxicity. Dioxins are formed naturally (from sources such as volcanoes and forest fires) and as unintended by-products of combustion of fuels and wastes. Like mercury, small quantities of dioxin build up in soils, sediments and plants, bioaccumulate in animal and fish tissue, and then pass up the food chain to people. In 2001, DES released the *New Hampshire Dioxin Reduction Strategy* that identifies the sources of dioxin in the state and makes specific recommendations to reduce dioxin releases to the environment. Since the release of this Strategy, several significant steps have been taken to reduce dioxin emissions.

Based on the 1999 emissions estimates in the Strategy, the state’s eight hospital, medical and infectious waste incinerators (HMIWIs) were New Hampshire’s largest combined source of dioxin emissions, producing almost 29 percent of the statewide total. Under the state’s federally mandated HMIWI plan, all New Hampshire HMIWIs were required to either comply with the emissions requirements of the plan or shut down by April 10, 2001. Since that time, six of the eight New Hampshire hospitals operating HMIWIs reduced their waste generation to the point where on-site incineration was no longer cost-effective, and have opted to permanently shut down their incinerators. This leaves only the state’s two smallest HMIWIs still in operation, resulting in a greater than 95 percent reduction of dioxin emissions from HMIWIs.

The Strategy also identified residential trash burning (backyard burning) as a major source of dioxin emissions. In 2001, legislation was passed to ban residential burning of household waste and to authorize DES to establish a dioxin emissions reduction and control program. The legislation, signed into law on July 16, 2001, prohibits all residential trash burning, effective January 1, 2003. DES has initiated

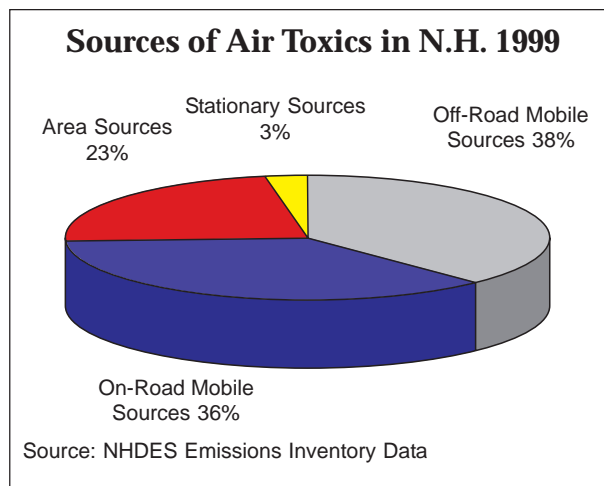
a campaign to educate the public about this new ban and promote alternative recycling and waste disposal options.

By addressing these two source categories (HMIWIs and residential trash burning), DES estimates that a 50 percent reduction in dioxin emissions will be achieved by 2003.

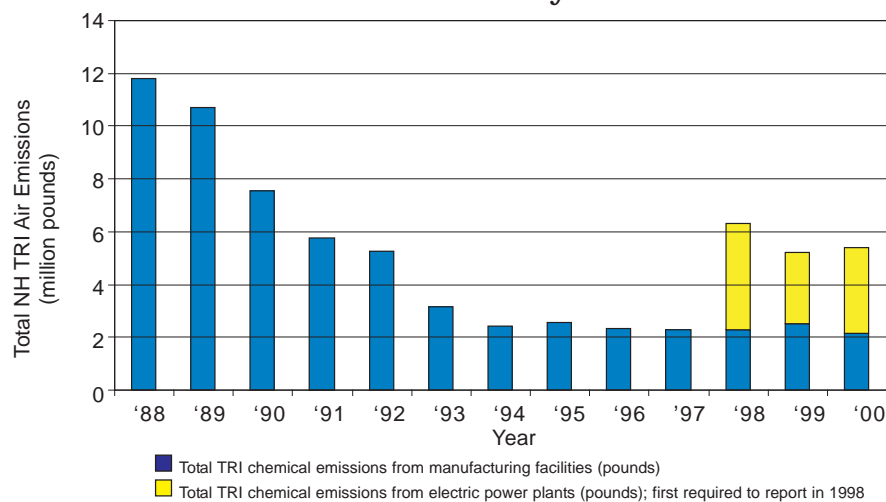
AIR TOXICS

Air toxics are pollutants that, at sufficient concentration and exposure, have the potential to cause cancer or other serious health effects. Examples of air toxics include benzene, formaldehyde, chromium, arsenic, vinyl chloride, and PBTs such as mercury and dioxin. In 1987, New Hampshire instituted an Air Toxics Control Program to regulate emissions of toxic air pollutants from all New Hampshire businesses. In 1999, a comprehensive air toxics monitoring program was established to measure levels of toxic pollutants in the ambient air and to evaluate associated public health risks.

Toxic air pollutants are not only emitted by large, industrial sources, but also by “mobile” sources (e.g., cars, trucks, boats, recreational vehicles, construction equipment), and “area” sources (e.g., home heating furnaces, dry cleaners, auto body shops). In 2001, EPA developed the first in a series of nationwide risk assessments associated with 32 toxic air pollutants and diesel particulates that currently present the greatest health risks to people (“priority” hazardous air pollutants). This program, the National Air Toxics Assessment program (NATA), helps agencies set priorities and collect data to better assess risk (see



Total N.H. Toxics Release Inventory Emissions 1988-2000



www.epa.gov/ttn/atw/nata). DES has conducted an emissions inventory of these pollutants from all New Hampshire sources and has found that on-road and off-road mobile sources dominate as the principal sources of toxic air pollutant emissions.

Industries continue to show significant progress in reducing toxic releases to the environment. New Hampshire companies annually report their releases of certain toxic chemicals to the air, water, and land. Data gathered from the Toxics Release Inventory (TRI) indicates that from 1988 to 1999, releases of toxic air pollutants from affected industrial sources in New Hampshire decreased by over 85 percent. The national average for the same time period is approximately 60 percent. In addition, beginning in 1998, large power plants were required to report their TRI emissions annually. Changes for 2000 and 2001 include lower reporting thresholds for PBTs, including mercury, dioxin and lead. These changes will significantly increase the information available to the public about PBT emissions in their communities.

DES will continue its efforts to reduce emissions of toxic air pollutants and ensure compliance with the air toxics control program through the N.H. Pollution Prevention Program (established in 1991), the Small Business Technical Assistance Program (established in 1992), and increased public awareness and education. More information on toxic air pollutant control programs in New Hampshire can be found at: www.des.state.nh.us/ard/toxpage.htm.

ACID RAIN

The complex natural relationships between air and water are inextricably linked, as nature shows us over and over again. Acid rain results when sulfur dioxide and nitrogen oxide gases react in the atmosphere to create acidic compounds. The acid is cycled back to earth as acidic precipitation, which degrades natural ecosystems and endangers public health. In-

creased acidity of lakes and streams endangers sensitive aquatic species. Acid rain also causes important nutrients, such as calcium and magnesium, to leach from forest soils, resulting in declines in forest health (most noticeably at higher elevations in the northeastern U.S. and eastern Canada). Acid precipitation is also at work eroding some of our most treasured national monuments, as evidenced by weathered statues, stone buildings and other structures.

Scientific evidence suggests that sulfur and nitrogen oxide emissions need to be further curtailed to prevent additional damage from acid rain. New Hampshire actively participates in a regional Acid Rain Action Plan, initiated in 1997 by the Conference of New England Governors and Eastern Canadian Premiers (NEG/ECP). The NEG/ECP Acid Rain Action Plan includes a number of technical initiatives that support additional emission reductions.

Two initiatives set to bear fruit in the summer of 2002 are the real-time fine particulate network project and the forest sensitivity mapping project. A real-time fine particulate network throughout New England and Eastern Canadian provinces will use continuous monitors to collect data and produce animated particulate "movies," similar to the ozone maps, to show the impact and movement of fine particulates across the region.

In addition, forest sensitivity maps for Vermont and Newfoundland will be used to indicate the vary-

ing sensitivity of forests to acid deposition throughout the two jurisdictions. Moreover, the maps will highlight those areas where the sensitivity is high enough to jeopardize forest sustainability with the current deposition rates. By the summer of 2004, these maps for the remaining five New England and three Canadian provinces should be completed.

Individuals can help reduce acid rain and its effects by taking steps to lower emissions of sulfur dioxide and nitrogen oxides. The continued emphasis on limiting emissions from power plants and major industrial facilities will help lower emissions that cause acid rain. DES encourages individuals to purchase energy-efficient lighting and appliances, conserve fuel and electricity whenever possible, and buy and use environmentally-friendly vehicles and yard equipment.

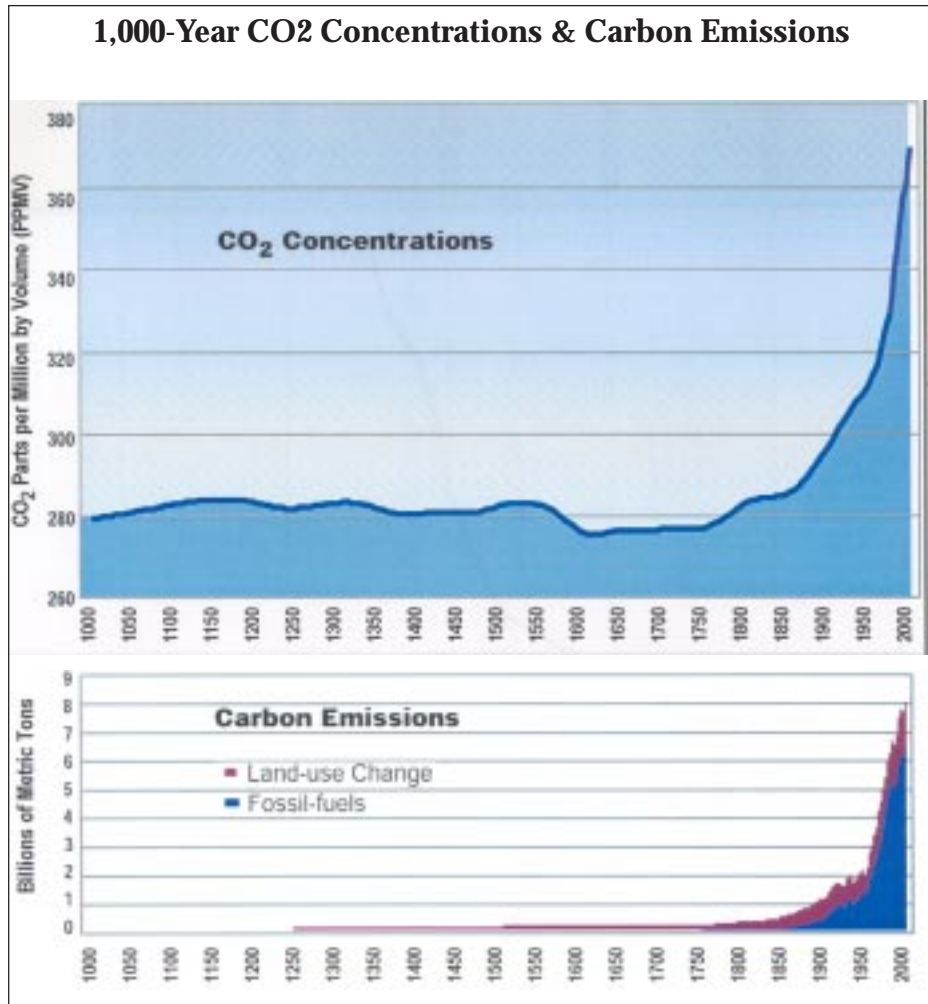
GLOBAL CLIMATE CHANGE

Air quality issues reach global proportions when it comes to climate change and the greenhouse effect. Carbon dioxide is the most prominent greenhouse gas (accounting for 92 percent of the total), in addition to smaller quantities of methane, nitrous oxide, and fluorocarbons. Scientific evidence points to the fact that many human activities are adding greenhouse gases to the atmosphere, resulting in concentrations of carbon dioxide higher than those estimated for the last 400,000 years. The primary source of increased greenhouse gas emissions from human activities is the combustion of fossil fuels as a source

of energy. This includes the use of gasoline as fuel for transportation and combustion of other fossil fuels for heating and electricity.

Greenhouse gases create an insulating layer in the upper atmosphere that effectively elevates temperatures on earth by trapping heat that is reflected back into the atmosphere from the earth's surface. This so-called "greenhouse effect" makes the earth habitable, but recent increases in greenhouse gases are intensifying this effect, altering the earth's climate. Some effects of global climate change are already being felt in the form of extreme weather events, wildfires, and melting polar ice caps.

Meteorologists and climatologists indicate that we have experienced the warmest period in recorded



Increased carbon emissions are causing higher levels of CO₂ in the air. Source: U.S. Global Change Research Program (2000).

history. The last months of the year 2001 began a weather pattern with temperatures being the warmest recorded in the 123 years of monitoring global temperatures. According to the National Oceanic and Atmospheric Administration (NOAA), the three-month period beginning November 2001 was the second warmest on record, 1.03°F above average. These temperature differences may seem minor. However, the long-term results of this continuing trend are of major consequence to public health, the economy, and the environment. Serious impacts to New Hampshire could include increased ozone concentrations and health impacts, the loss of the skiing and maple sugar industries, widespread tree mortality, decreases in cold water fisheries, and impacts or losses associated with a rise in sea level.

Reducing Greenhouse Gases

In response to concerns about climate changes and its impacts, in 2001 New Hampshire developed a report entitled *N.H. Climate Change Challenge*. It summarizes the current status of issues, lists resources for further investigation, and makes recommendations for reducing greenhouse gas emissions through a combination of voluntary and regulatory approaches. Like

Clean Power Strategy Targets Multiple Pollutants

With the release of the *N.H. Clean Power Strategy* in January 2001, New Hampshire was the first state in the nation to adopt an aggressive strategy to reduce emissions of multiple pollutants from fossil-fueled power plants. This strategy calls for the state's three fossil-fueled power plants—Merrimack Station in Bow, Newington Station in Newington, and Schiller Station in Portsmouth—to reduce emissions of four major pollutants, either by using new technologies or by purchasing emissions reduction credits, or a combination of both.

The goals of the *N.H. Clean Power Strategy* are to reduce, by 2006, emissions of sulfur dioxide by 75 percent; nitrogen oxides by 70 percent; mercury by 75 percent; and carbon dioxide by 7 percent. The strategy promises to yield multiple environmental benefits.

Innovative Agreement Cuts Pollution & Saves Money for Groveton Company



It is increasingly recognized that a healthy environment and a vital economy go hand-in-hand. A 2001 agreement between EPA, DES, and Groveton Paper Board, Inc., a North Country paper mill, to install alternative air pollution controls is a good example. The agreement resulted in a reduction of four times more pollution than normally would have been required by federal law, at a significant cost savings for the company.

This agreement was the first in New England developed under an expedited process for federal/state environmental innovations. Under federal rules, the company would have been required to install a \$1 million system to capture and incinerate emissions of airborne methanol. Because of the unique characteristics of the plant, it could achieve significantly more pollution reduction by treating process water at the plant to remove methanol. This alternative treatment will result in four times the methanol emissions reductions—or an estimated 42 tons per year, versus 11 tons from incineration. Additionally, it will reduce other hazardous air pollutants by 20 tons per year. Moreover, the process water treatment technology, which costs \$175,000, resulted in a savings of \$825,000 from the incineration method initially required.

DES issued an alternative air permit to Groveton Paper Board, specifying a timeline for completion of the alternative controls. This remarkable success story demonstrates that environmental protection and economic growth can be complementary and that pollution prevention measures can be cost effective. It also illustrates that government agencies and companies can work cooperatively in pursuit of new concepts and innovations.

other multi-pollutant strategies, the *N.H. Climate Change Challenge* offers strategies that focus on improved energy use and efficiency, as well as other options, to help reduce greenhouse gases and other air pollutants simultaneously.

New Hampshire also participated in a cooperative effort to develop a regional climate change action plan under the auspices of the Conference of New England Governors and Eastern Canadian Premiers (NEG/ECP). The *NEG/ECP Climate Change Action Plan* calls for a proactive and aggressive approach to reducing greenhouse gases and sets specific goals and targets for reducing greenhouse gases. The *N.H. Climate Change Challenge* provides the measures and actions necessary to meet the greenhouse gas emission reduction goals set forth by the NEG/ECP.

The key solution to climate change, as well as other air quality problems, is to use less fossil fuel-based energy and to use it more efficiently. Use of renewable energy sources and alternative fuels will help reduce greenhouse gas emissions. Encouraging the use of cleaner, fuel-efficient motor vehicles will lessen impacts from mobile sources. Modernizing our homes with energy-efficient heating, lighting, and appliances not only reduces energy use, but saves money too. In short, steps that reduce greenhouse gases make sense both for the environment and for the economy.

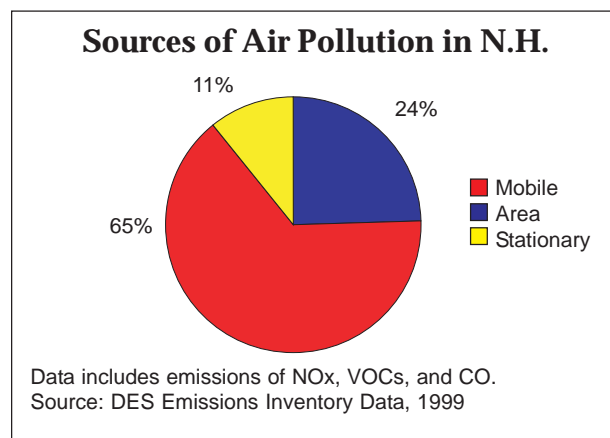
MOBILE SOURCES

Automobile manufacturers have made great progress over the past three decades in reducing air pollution from motor vehicles. Despite this progress, across the nation people are buying more cars and



RIDE FREE – BREATHE FREE

To help reduce air pollution from motor vehicles, New Hampshire's public transit providers initiated a program to offer free bus rides during the summer of 2001 on *Air Quality Action Days*. DES and the Department of Health and Human Services declare *Air Quality Action Days* for parts of New Hampshire when ground-level ozone, or summertime "smog," is forecast to reach unhealthy levels. During the summer of 2001, there were ten days when air pollution concentrations reached unhealthy levels. On those days, individuals in affected regions are encouraged to take advantage of free public transportation, instead of driving their own cars. The program not only increases awareness about the health effects of ground-level ozone, but it also encourages people to use public transportation as a way to reduce ozone-forming emissions from motor vehicles.



driving more miles than ever before. Emissions inventories show that mobile sources continue to be a major source of air pollution, producing significant amounts of nitrogen oxides, particulate matter, volatile organic compounds, toxics, carbon monoxide, and greenhouse gases. DES is engaged in a number of initiatives aimed at reducing air pollution from mobile sources.

One of the most significant ways to impact vehicle emissions is through new vehicle emission standards. However, the federal Clean Air Act in most cases precludes states (other than California) from

adopting separate state standards. In order to influence federal policy and regulatory efforts, DES actively participates in regional and national forums aimed at achieving the greatest emissions reductions possible on a national basis. Examples of such efforts include state support for new federal standards on cars and light trucks, heavy-duty diesel engines, and fuels. Because these efforts are directed at newly manufactured vehicles, their impact may not be observed for several years until newer vehicles have replaced older ones.

New Hampshire's residents and visitors hold an important key to reducing mobile source pollution. As stewards of a precious airshed, individuals can help keep the air clean by making choices about buying and using motor vehicles that are good for the environment. DES encourages walking or riding a bike instead of driving a car, carpooling, combining errands for fewer trips, keeping vehicles well-maintained and tuned-up, avoiding idling, and keeping tires properly inflated.

DES encourages consumers to pay attention to fuel economy ratings and emissions levels when shopping for a new vehicle. Motor vehicles manufactured today come in a wide variety of makes and models. Within the same class of vehicles there is a range of fuel economy ratings and emissions levels. By purchasing the most fuel-efficient, least polluting vehicle in a particular class, consumers can help reduce air pollution without sacrificing vehicle use or size.



Driving might just be the most polluting thing you do each day—unless your vehicle is a low emission, high miles-per-gallon vehicle like this one driven by DES engineer Becky Ohler.

DES is also working with fleet owners and managers, especially those who operate diesel-powered vehicles, to reduce air pollution and excess smoke from their vehicles. DES supports the statewide smoke opacity testing program administered by the N.H. Department of Safety, and encourages fleet managers to conduct periodic inspections of emission control equipment on their trucks and buses. Another major effort initiated by DES in 2001 is aimed at reducing idling of school buses and trucks. Working with the statewide trucking association and school transportation association, DES is educating fleet owners and drivers about the health and economic benefits of limiting idling time, and about the state regulations which establish idling time restrictions.

DES has made it a priority to “lead by example” when it comes to purchasing new vehicles by incorporating alternative fuel and advanced technology type vehicles into its fleet. These vehicles provide the lowest emission levels and help reduce dependence on imported oil. By the end of 2001, the DES fleet contained eight compressed natural gas vehicles, two electric vehicles, and five hybrid electric vehicles, including the one shown below. The increasingly popular hybrid technology combines the use of both a gasoline engine and an electric motor to increase fuel economy.

Waste Management & Site Cleanup

DES's Waste Management Division, in cooperation with the Air Resources and Water Divisions, provides a coordinated approach to addressing pollution sources and remediating contaminated sites. "An ounce of prevention is worth a pound of cure" is a truism that is part of the Waste Management Division's daily fare. DES's basic strategy is to: prevent occurrences of events and practices that may lead to contamination; minimize the impacts of materials that become contaminants when misused or spilled; and, efficiently and effectively utilize the Department's personnel and financial resources in environmental restoration.

In mobilizing and sustaining this effort, avoidance strategies are used that often provide the greatest benefits for the least cost. We continue to focus on toxicity reduction; household hazardous waste management; pollution prevention; landfill closure; recycling; as well as permitting and training of waste facility operators. We also devote significant financial resources to oil spill prevention, oil and hazardous waste emergency response, hazardous waste and petroleum contaminated site remediation and Brownfields redevelopment. The Division also played a key role in the development of the Governor's Solid Waste Task Force report. Each of these aspects of our work are described in the following pages.

SOLID WASTE TASK FORCE

In 2001, the N.H. Solid Waste Task Force submitted extensive recommendations to the Governor. Created in 1999 and composed of representatives of municipal government, the legislature, DES, the Attorney General's Office, and industry, environmental and business interests, the Task Force was charged with several objectives. These included: assisting DES in its review of changes in the solid waste industry; identifying long-term options to address the importation of solid waste; identifying and investigating recent cost increases; and providing recommendations for future solid waste disposal options for the residents and businesses of New Hampshire.



Waste management facilities are regularly inspected by DES. Here, solid waste compliance supervisor David Rousseau reviews a newsprint recycling operation at a municipal transfer station.

The Task Force's report lists a number of findings regarding the above concerns. Key findings recognized that the trend towards industry consolidation is not limited to New Hampshire; it is regional and national. It was determined that there is adequate disposal capacity in the state until 2010; imports of solid waste have already significantly decreased; and the cost of solid waste disposal in New Hampshire is slightly higher than other states in the region.

The Task Force made 26 recommendations. Many of the recommendations are directed to state agencies, but the report notes that the responsibility for implementing the recommendations must be shared by both the public and private sectors.

The report is available at the DES web page, www.des.state.nh.us, or from DES's Public Information Center at (603) 271-2975.

AVOIDANCE STRATEGIES

Toxicity Reduction

New Hampshire enjoys renown as a tourist state while, at the same time, nurturing a vibrant manufacturing and technological economic base. With the booming economy of the 1990s, the state experienced rapid growth in new businesses, many of which use hazardous materials and which produce hazardous wastes. In fact, there are some 5,400 generators of

hazardous waste in the state. Though most of these are small generators, experience shows that it sometimes takes but a small amount of waste to seriously threaten the environment and public health. A DES Resource Conservation and Recovery Act (RCRA) program takes steps to ensure proper hazardous waste management throughout the state.

Another area of prevention is related to petroleum, either virgin product or used oil. Oil is a common groundwater and surface water contaminant. It takes only one pint of oil to produce a one-acre oil slick or one quart to contaminate 250,000 gallons of groundwater. In order to provide residents with convenience in disposing of used oil, the State provides grants to municipalities to encourage the collection of used oil. Growth of that program since its inception in 1995 has been dramatic. Since that time, used oil grants totaling over \$350,000 have been awarded



Reducing toxics from the environment is done in many ways, including through hazardous waste inspections, like this one by DES waste management specialist Tod Leedburg.

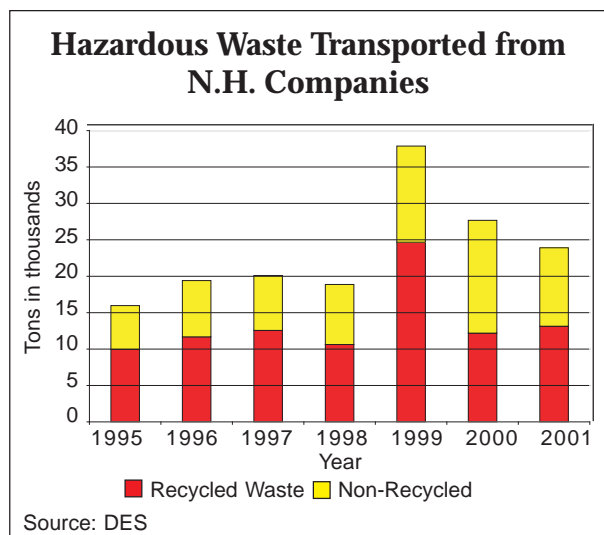
to 136 municipalities. In total, 159 towns have benefited from these grants, as some collection centers are shared by more than one town. To date, 960,000 gallons of used oil that might otherwise have been disposed of improperly were collected by grant-funded facilities.

DES is also vigorously promoting pollution prevention, reuse of hazardous materials, and recycling as means to assure proper management of these toxic

wastes. Education, compliance assistance and enforcement all play an integral part in the management of hazardous waste. Whether we are talking about industrial wastes or everyday trash, the public is protected by removing toxic materials from the waste stream before they are incinerated or placed in a landfill. Detoxification is particularly important since most of the design requirements for building a state-of-the-art landfill or a waste incinerator are related to the anticipated presence of toxic materials that are commonly an indistinguishable part of the waste stream.

Toxics Tracking

In New Hampshire, DES tracks the movement of hazardous waste, registers hazardous waste transporters, conducts compliance investigations, responds to hazardous material spills, and inspects generators of hazardous waste. DES also works with industry to encourage pollution prevention, recycling and waste minimization. The bar graph shows the past seven years of hazardous waste recycling as compared to disposal. Solvent recovery and energy recovery are the largest recycling uses. On average, and excluding 1999 as an anomalous year, 58 percent of hazardous waste was recycled. In 1999, the total and recycling percentage rose due to the one-time inclusion of nearly 17,000 tons of coal tar derived from a construction project. The data suggest a sustained trend in hazardous waste recycling by industry.



Household Hazardous Waste Collection

Although household hazardous waste makes up only 2 percent of the volume of solid waste, it contributes over 80 percent of the toxicity in the waste stream. In the past fifteen years, the DES Household Hazardous Waste (HHW) Collec-



Municipal household hazardous waste collections, like this one in Wakefield, are increasingly popular across the state.

tion Program has provided over 350 grants totaling over \$2.9 million for HHW collection projects. In 2001 alone, HHW events resulted in the collection of over three quarters of a million pounds of homeowner-generated hazardous wastes which otherwise would have been either saved or improperly discarded. DES funding also supported the development of three permanent HHW collection centers in Nashua, Keene, and Wolfeboro, and several product reuse centers where hazardous household products, such as paint thinner, engine degreaser and other reusable products may be left or exchanged for other items. The Household Hazardous Waste Program also provides information on environmental consumerism and environmentally-safe substitutes for toxic household products.

Pollution Prevention

In 1991, the Department established the N.H. Pollution Prevention Program (NHPPP) to promote pollution prevention strategies within the state's businesses, institutions, public agencies and municipalities. Pollution prevention is a cornerstone of the agency's approach to waste management. The program is non-regulatory and promotes pollution prevention through free, confidential site assistance, technical research, conferences, education curricula development and stakeholder partnership projects. A highlight of the NHPPP's activities is the annual Governor's Award for Pollution Prevention, which honors special projects and programs undertaken by New Hampshire manufacturers and organizations, and which is presented at the annual Pollution Prevention Conference. Today, a pollution prevention

philosophy has been incorporated into almost all the agency's activities, as well New Hampshire schools, towns, and hospitals, in addition to businesses. NHPPP is in the enviable position of being able to contribute simultaneously to the improvement of New Hampshire's environment and its economy.

Landfill Closure Program

Unlined landfills, which can negatively impact groundwater quality, are being used less and less. Eighty percent of wastes are currently transported to three commercial lined landfills and two commercial "waste-to-energy" incinerators. Over 85 of the 154 municipally-owned solid waste landfills in New Hampshire have closed, or are in the process of closing. An additional 69 active and inactive unlined landfills are scheduled for closure by 2011 through an aggressive program funded by a combination of 20 percent state grants to the communities and low interest loans from the State Revolving Loan Fund.

There has been a substantial change in the mix of facilities over the past 27 years. However, more recently, the trend has been toward more landfilling of waste in lined landfills, as communities close their unlined landfills consistent with the State's efforts to protect groundwater quality. The volume of waste disposed of in waste-to-energy (WTE) facilities is expected to remain essentially constant during the operative lives of the two existing WTE incinerators.

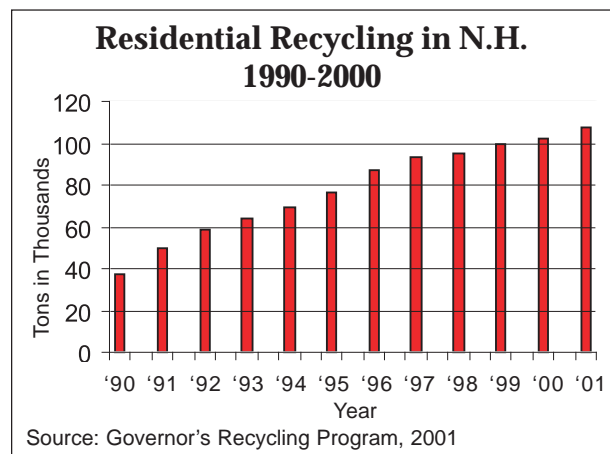


Closing old, unlined landfills such as Manchester's requires a highly engineered operation involving a number of capping layers, including plastic (above), which in turn is covered by sand, then topsoil. A gas management system and groundwater monitoring wells are also typically installed to help ensure long-term protection.

Recycling

Many New Hampshire communities continue to provide recycling programs, offering people the chance to recycle common items such as newspapers, aluminum, glass, plastic, and mixed paper. To encourage recycling, 117 towns have mandatory recycling ordinances, 36 communities have a “pay-as-you-throw” disposal program, and 39 communities offer curbside recycling. Additionally, many communities are reaping the benefits of composting, which lessens their costs of disposal and provides a valuable fertilizer to community residents.

In 1990, the New Hampshire Legislature set a goal of 40 percent solid waste diversion for the state,



to be reached by the year 2000. The state's diversion rate in 2001, including recycling, composting, source reduction and reuse, was approximately 23-24 percent. The estimate may be low since reporting is not required for businesses, industry and institutions, however, it seems clear that the state did not reach the legislative goal. DES continues to pursue initiatives that will increase diversion. One such effort is a comprehensive review of the measurement of diversion, both of municipal solid waste and industrial/commercial solid waste. This information will allow a more accurate look at our progress so that we better target large volume waste streams and other problem wastes. DES also works closely with the Legislature in the pursuit of increasing the state's diversion rate. Education to emphasize the financial benefit of recycling, compared to other more expensive disposal options, remains a key to achieving increases in recycling.

Solid Waste Operator Training and Certification

Over the last twenty years, solid waste management issues have become complex and critical due to an increase in urbanization and industrialization, combined with growing pressure on solid waste disposal capacity. In response to this challenging situation, a Solid Waste Operator Training and Certification Program was developed by DES in 1990 to provide education and training on waste management technology and practices.

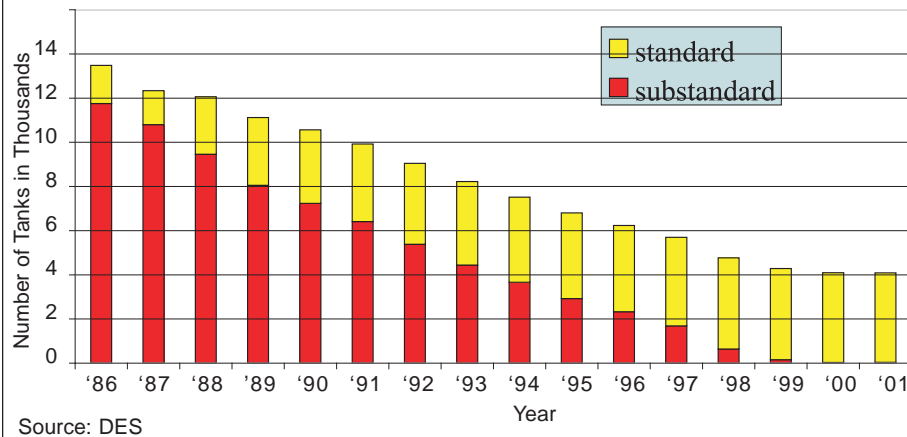
The program certifies operators at four different levels from entrance level to the managerial level. In order to become certified, an applicant must fulfill certain education and experience requirements, attend training courses provided free-of-charge by DES, and successfully complete a written or oral examination. To maintain certification, operators participate annually in a continuing education program by selecting one of nearly twenty workshops offered on a variety of topics such as equipment safety, development of management skills, household hazardous waste collection, recycling and composting. Often, workshops are held at solid waste facilities throughout the state so that operators can learn through “hands-on” activities. Over 2,000 operators have successfully completed the program since its inception.

Oil Spill Prevention

Underground storage tank (UST) systems containing petroleum and hazardous materials have been regulated since 1985. Since that time, about 14,700 petroleum tank systems have been permanently closed. US EPA requires that sub-standard systems, that is steel UST systems without corrosion control and/or lacking overfill and spill prevention, be permanently closed. To date, 13,300 substandard systems have been permanently closed. New Hampshire has thus achieved nearly 100 percent compliance compared to the 85 percent national average.

In 1997, New Hampshire adopted its first set of regulations covering about 3,300 aboveground petroleum storage tank systems (ASTs) that are registered with DES. Generally speaking, the AST rules require registration of storage, transfer, or distribution facilities that have a single tank system with an oil storage capacity of more than 660 gallons or

Active Standard vs. Substandard Underground Storage Tanks per Year



MINIMIZING IMPACTS

While avoidance and prevention of contamination are of paramount importance, DES is prepared to act rapidly to minimize the effects of spill events.

Emergency Response/Preparedness

DES maintains a 24-hour per day, seven days a week emergency re-

sponse capability for both oil and hazardous waste spill incidents on land or water. In a typical year, there is about one oil spill per day. These spills vary in magnitude, but typically they range from ten gallons to a few hundred gallons. On average, there is a hazardous waste response required of DES every third day, half requiring on-scene participation or advice to the incident commander, typically the local fire chief. The balance are handled by telephone advice and involve incidents such as broken mercury thermometers in the household or in schools. Hazardous waste inci-

dent systems with a combined oil storage capacity of more than 1,300 gallons.

In 1999, DES instituted a new *Safetank* program for residential homeowners with substandard heating oil tank systems. The program provides up to \$1,000 per residential household for repair or replacement of such systems. This program is very important to the prevention of serious problems. To date, 1,244 on-premise spills have been reported, and more than \$9 million has been provided by the state to clean up these spills.

dent systems with a combined oil storage capacity of more than 1,300 gallons.

DES RESPONDS TO TRAIN DERAILMENT

Each year, DES emergency response personnel are called to hundreds of petroleum spills and other environmental incidents. In April of 2001, a train derailment in Vermont plunged three locomotives and thirteen freight cars down an embankment into the Connecticut River. New Hampshire owns the entire span of the river, from bank to bank, and state officials helped extensively in the cleanup operation and water quality assessment. Below right, DES Petroleum Response Chief Rick Berry oversees the vacuuming of diesel fuel from an area surrounded with a containment boom.



dents, though fewer and typically smaller in volume, may pose significant risk to human health and the environment due to the nature of the materials involved.

DES has also established and equipped an Incident Command Center at the Pease International TradePort specifically designed to provide for an effective command and control capability for the cleanup of spills in the Piscataqua estuary. Cross training of DES staff with the help of the U.S. Coast Guard and the Coast Guard Auxiliary is on-going and helps prepare the team for a multi-day response.

Rapid deployment of cleanup equipment is facilitated by storage in trailers and sheds that have been staged at various locations in the Piscataqua/Great Bay area. The importance of this rapid deployment capability cannot be overstated since the tidal currents in the Piscataqua estuary are among the strongest in the nation, and the large areas of tidal flats are vulnerable to environmental damage.

CLEANING UP CONTAMINATED SITES

In the 1960s and 1970s, the public health and environmental risks of numerous hazardous waste sites became very apparent. Cleaning up these sites has been, and remains, a high priority for DES. Leadership for cleanup actions is shared by state and federal agencies in some cases, while in others, oversight is provided when the responsible parties assume responsibility for cleanup.

Hazardous Waste Contaminated Sites

Superfund Sites. In 1980, Congress enacted the Comprehensive Response, Compensation and Liability Act (CERCLA) more commonly known as "Superfund," and established a trust fund to provide for cleanup at sites where hazardous substances may endanger public health or the environment. New Hampshire has 18 such sites, most of which were discovered and listed on the National Priorities List in the 1980s. The last site, Beede Waste Oil in Plaistow, was listed in 1996. Remedial actions are underway at 15 of the sites, and remedial design is done or is soon to be completed at the others. Over the years, an estimated 100,000 human exposures to potentially harmful materials have been controlled through actions such as extending waterlines to homes with threatened or contaminated drinking water, the re-



Contaminated soil is treated at the Ottati & Goss/Great Lakes Container Corporation Superfund site in Kingston.

moval of hazardous materials from properties, and the demolition of buildings following decontamination.

Remediation has been completed at two sites. Treatment operations at the Gilson Road Site in Nashua were carried out between 1984 and 1998. One billion gallons of groundwater were treated and 430,000 pounds of contaminants were removed. At the former Pease Air Force Base Site, a \$145 million environmental restoration has been completed, allowing reuse of over 3,000 acres. This has contributed to the success of the Pease Development Authority and has allowed new businesses to move in with the creation of over 4,600 jobs.

In addition to the cleanup of National Priorities List sites, the state, supported by USEPA, has conducted emergency removal actions. These are short-term, immediate actions intended to stabilize a hazardous incident or remove contaminants from a site where an imminent public health threat exists. In the past 20 years, approximately \$30 million of federal Superfund money has been spent in New Hampshire to address the investigation, evaluation, and cleanup of non-National Priorities List sites. DES works closely with USEPA in both long-term site remediation and in emergency response.

Non-Superfund Hazardous Waste Sites. New Hampshire has approximately 700 sites that are non-Superfund hazardous waste sites which have various degrees of public health and environmental impacts. Of those sites, about 200 have been added since 1996. About 60 percent of the sites have been cleaned

GILSON ROAD SITE MEETS CLEANUP GOALS

The Gilson Road site in Nashua is of particular interest at this time since it is deemed to have met all of its groundwater cleanup goals. The USEPA and DES have removed the groundwater treatment equipment and the outdoor storage tanks at the \$5.4 million facility constructed in the mid-1980s. The building itself will be retained for storage and field office purposes.

During the 1970s, over 900,000 gallons of liquid hazardous wastes were illegally disposed into an on-site leach field. Much of the hazardous waste seeped into the site soils and contaminated over 100 million gallons of groundwater. The violator was brought to justice by the N.H. Attorney General's Office. To ensure protection of public health and the environment, several actions were taken, including extending the City of Nashua's municipal water lines to the residential area surrounding the site in 1983. Also, with funding from USEPA and DES, an impermeable slurry wall was built to surround the contaminated groundwater and to limit off-site migration.

In 1984, construction began on a facility to pump the enclosed groundwater. The facility treated more than one billion gallons of groundwater, removing more than 430,000 pounds of contaminants at a total cost of over \$30 million.

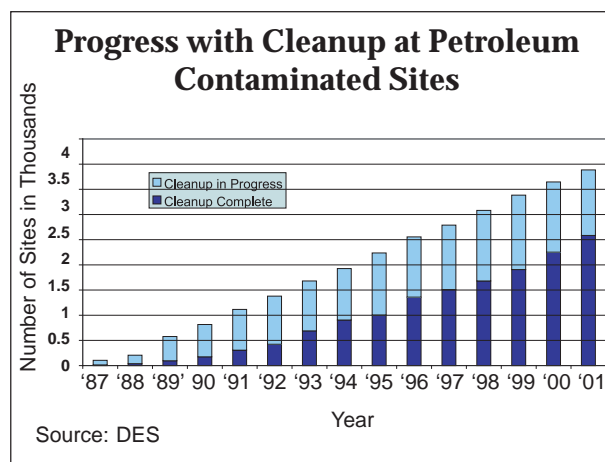
In 1995, USEPA and DES determined that clean-up goals for the site had been achieved, and in January 1996 groundwater treatment ceased. Rather than decommission the treatment plant at that time, the plant was maintained in a ready state in case groundwater contaminant concentrations rebounded, warranting further groundwater treatment. Fortunately this did not occur, and decommissioning of the site has occurred.



up or are in the process of being cleaned under a permit. The majority of the active sites are being cleaned up by private parties under the state's voluntary cleanup program. Other sites are being addressed using a combination of state and federal brownfields funding initiatives, local government resources and private development assets.

Petroleum Contaminated Sites

Leakage from underground petroleum storage tanks and spillage has been identified at over 3,800 contaminated sites in New Hampshire since 1975. DES has overseen the completion of cleanup efforts at more than 2,500 of those sites. As shown below, about 2,500 sites have been cleaned up over a period of 14 years, or on average, about 180 sites per year. While 65 percent of the known sites are complete, 240 new sites were discovered in 2001. Seventy percent of these newly discovered sites were on-premise-use fuel tanks, which are being addressed in part through the *Safetank* program previously described.



Brownfields Redevelopment

Brownfields are abandoned or under-utilized properties where redevelopment is complicated by real or perceived environmental contamination. The Brownfields Program at DES works to clean up and aid in the redevelopment of these sites, which are often located in or near town centers. This helps to revitalize communities, by keeping jobs and services in downtown areas, and deter sprawl by directing new development away from green space.

DES estimates that there are at least 250 brownfields sites in the state. While the locations of



(Above) When abandoned, the future of the Whitney Screw Company site in Nashua looked bleak. However, a few years later, the brownfields site's cleanup and restoration was celebrated by federal, state, and local officials (below).



these sites are often desirable, concerns about contamination and the attendant environmental liability discourage developers' interest. In 1996, a New Hampshire brownfields bill established the Brownfields Covenant Program, which provides liability protection for persons who assume responsibility for property remediation, but who have no pre-existing liability. In January 2002, President Bush signed the Small Business Liability Relief and Brownfield Revitalization Act. This legislation will provide for significantly increased funding (up to \$250 million a year) for state response programs, brownfields assessment, revolving loan funds, and site cleanup.

Some of the common environmental problems associated with brownfields sites are unsafe buildings, fire hazards, chemical spills, leaking under-

ground storage tanks, and soil and groundwater contamination. DES uses an integrated approach (utilizing local, state, and federal resources) to leverage private investment in brownfields cleanup and redevelopment. Financial assistance includes the funding of brownfields site assessments for municipalities, tax incentives, and the Brownfields Cleanup Revolving Loan Fund (BCRLF).

As the year 2001 came to a close, DES made its first loan under the BCRLF to developers of the former Whitney Screw site in Nashua. The loan proceeds, totaling approximately \$190,000, were used to finance cleanup of contamination on the site. The loan, together with assistance from the Nashua Brownfields Assessment Pilot, DES's USTfields Pilot, and DES Petroleum Reimbursement Funds, leveraged over \$2 million in private investment at the site. The five and one-half acre site, with 90,000 square feet of building space, is being cleaned up and renovated to meet the retail, warehouse and office space needs for New Hampshire's largest bicycle dealer, and an additional tenant. To date, over 40 New Hampshire sites have benefited from DES's Brownfields initiatives.

FUNDS FOR CLEANUP

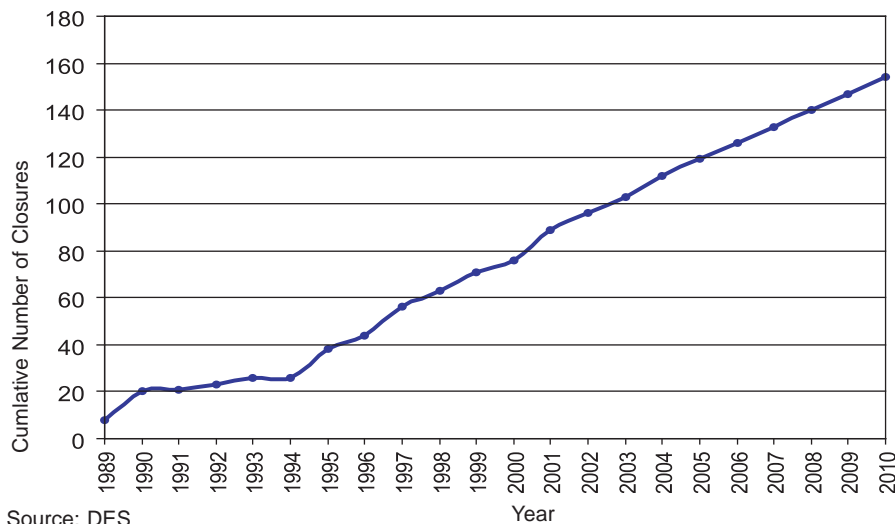
CERCLA

The CERCLA Trust Fund monies are shared with the states through cooperative agreements. New Hampshire has had such an agreement for many years. This allows DES to coordinate cleanup activities and to receive federal funds to do so. To date, the state and the USEPA have expended approximately \$165 million for design studies and construction, to clean up the state's 18 National Priority List sites. Further money has been spent on contaminated brownfield sites that are abandoned or underutilized industrial, commercial, or residential sites.

Petroleum Cleanup Funds

DES provides funding from both federal and state sources to assist in oil spill containment and cleanup efforts. Federal assistance is derived from the Leaking Underground Storage Tank (LUST) Trust Fund and the Oil Spill Liability Trust Fund established by the Oil Pollution Control Act of 1990. Since 1989, DES has received more than \$8 million from

Cumulative Number of Municipally-Owned Unlined Solid Waste Landfill Closures, 1989 Projected Through 2010



Of the 154 unlined landfills slated for closure by 2010, over 90 have now been closed in accordance with state environmental standards. The grant program allows municipalities to be reimbursed 20 percent of eligible capital costs associated with landfill and/or incinerator closures.

the LUST Trust Fund to coordinate cleanup activities associated with contamination originating from leaking underground storage tanks. DES has also received approximately \$850,000 during the last four years from the Oil Spill Liability Trust Fund for removal actions to mitigate the impacts of oil discharges to navigable waters or adjoining shorelines.

The New Hampshire petroleum reimbursement funds are a financial assistance program for owners of above and below ground petroleum storage facilities storing motor fuels, heating oils and motor oil. The fund provides insurance of up to \$1.5 million for sites at which these fuels have caused a contamination problem. The fund disburses about \$7 million per year to owners to clean up petroleum-contaminated sites. The state petroleum remediation program investigates and remediates petroleum spills at sites not covered by the federally regulated underground storage tank program. These sites consist of heating oil underground storage tanks, petroleum aboveground storage tanks and inland oil spills not associated with storage facilities such as from petroleum tanker trucks. This fund has had average expenses over the last five years of approximately \$1.6

million and has expended \$18.4 million since 1980.

Unlined Landfill and Incinerator Closure Grant Program

The state landfill closure grant program became effective on July 1, 1995 and was expanded to include 18 municipal incinerators constructed prior to July 1, 1998. The purpose of the grant program is to reimburse municipalities 20 percent of eligible capital costs associated with landfill and/or incinerator closures. These costs include hydrogeological

investigation, engineering design, and construction of closure elements.

DES has awarded over \$22.8 million since the inception of the grant program in 1995. To date, over \$13.9 million has been paid, with the remaining balance to be paid through the year 2020. Grant money awarded was much greater in the first few years of the program, due to already completed closures eligible to apply for reimbursement. Over the last two years, the rate of grant money awarded has been more consistent with the current rate of landfill and incinerator closures.

MANAGEMENT & OVERSIGHT

All of the programs mentioned above depend upon a skilled DES staff including hydrogeologists, engineers, chemists, and other technical and information resource specialists. These individuals participate in permitting, remediation investigations and field work; facility inspection; financial management of federal and state funds; emergency response; addressing legal issues with the New Hampshire Department of Justice; and developing and providing testimony before the state Legislature and the U.S. Congress.

Protecting Water Quality

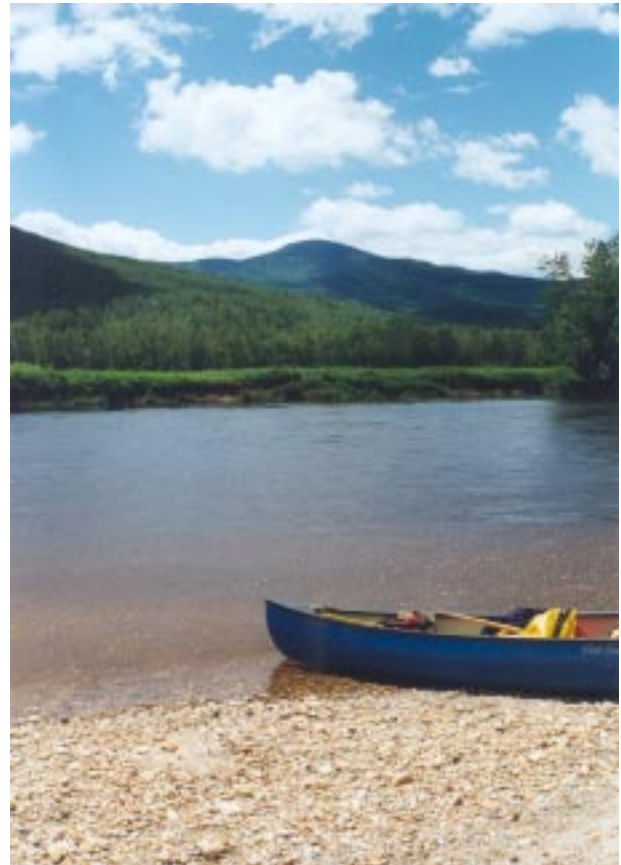
New Hampshire residents and visitors alike depend upon the state's water resources to serve multiple purposes, from basic sustenance to the enjoyment of numerous recreational activities. The health of our waterbodies must be maintained to protect aquatic ecosystems, ensure that the water we drink is readily available and free from harmful chemicals and bacteria, and allow safe swimming, fishing and harvesting of shellfish. This past year has been particularly challenging due to record low precipitation and potential security threats to our water resources.

COASTAL WATERS

Shellfish Harvesting

A useful indicator of the health of New Hampshire coastal waters is the status of shellfish harvesting areas. DES's Shellfish Program works diligently to monitor estuarine waters with the goal of identifying and abating pollution sources. DES routinely evaluates the safety of the state's tidal waters by collecting water samples, and analyzing blue mussels, which are an 'indicator species' for toxic contaminants in shellfish beds.

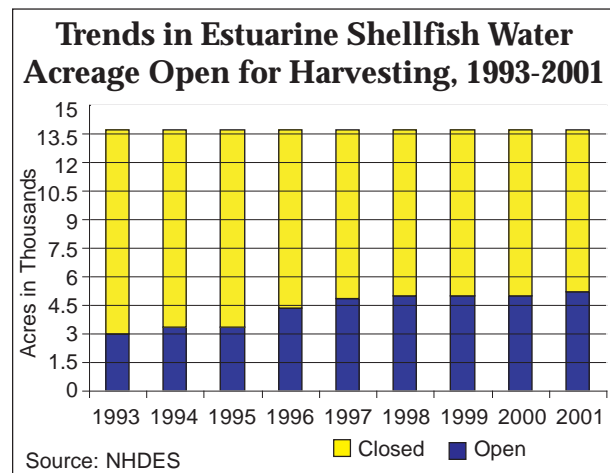
Currently, 5,183 estuarine acres are approved for shellfish harvesting. However, 62 percent of the state's 13,717 acres of estuarine waters remain closed. The majority of these areas are closed because they have not yet been evaluated for sanitary quality. In



A quiet stretch of the Androscoggin River.

1999, DES and the New Hampshire Estuaries Project began an aggressive schedule of conducting sanitary surveys with the goal of having all areas surveyed by 2005.

Tracking the number of acres of shellfish waters does not give a complete picture of the status of shellfish. This is because nearly all shellfish waters are subject to temporary closures for various reasons including stormwater inflows and wastewater treatment plant problems. The DES Shellfish program has developed a tracking system to measure the actual "acre-days" that shellfish waters are open for harvest during a season. In 2000, 43.8 percent of the possible acre-days were open for harvesting. In 2001 there was a significant increase in the number of acre-days in Hampton/Seabrook (8,899 to 11,995), Upper Little Bay (59 to 68), and Lower Little Bay (59 to 64). Despite



this fact, the percentage of acre-days dropped slightly to 43.6 percent, due to prolonged closures in the Great Bay Estuary.

Using Blue Mussels to Monitor Estuarine Health: The New Hampshire Gulfwatch Program

The Gulf of Maine Gulfwatch program is a mussel-monitoring program that began in 1991 to provide information on the status of environmental quality throughout the Gulf of Maine. One of the goals of the New Hampshire Gulfwatch program is to assess the impact of toxic contaminant exposure, particularly oil, to marine organisms in New Hampshire estuarine waters.

An opportunity to evaluate the impact of an oil spill came in 1996 when approximately 1,000 gallons of #6 fuel oil leaked from the vessel *Provence* into the Piscataqua River and dispersed into nearby areas of Great Bay. The Gulfwatch sampling site on Dover Point, located approximately 2.5 miles upstream of the oil spill site, was sampled by the Gulfwatch pro-



DES Nonpoint Source Specialist Matt Wood collects blue mussels on Pierce Island in Portsmouth as part of the N.H. Gulfwatch sampling project.

gram before the spill in 1994, and after the spill in 1997 and 1998. In addition, mussels from the spill site were tested for oil shortly after the spill to determine if oil from the spill was taken up by the mussels, and how long it took the mussels to eliminate the contaminants.

As expected, all contaminants detected in the

samples collected shortly after the spill were at higher concentrations than those in the other samples. Comparison with the 1997 Gulfwatch results shows that the pollutant concentrations of oil-based contaminants in the mussels had decreased greatly since the spill, and by 1998 they were almost back to pre-spill levels.

In addition to documenting the impact of oil spills, the Gulfwatch program has provided data on the widespread presence of mercury in the estuarine ecosystem and is providing a valuable regional perspective on marine contamination and its effect on marine life.

Hampton/Seabrook Harbor Clam Mortality Study

Since 2001, researchers have been conducting a study to determine why juvenile clams are unable to survive to adulthood in Hampton/Seabrook Harbor. The study is sponsored by the New Hampshire Estuaries Project in coordination with the DES Shellfish Program, N.H. Fish and Game Department, and the University of Maine at Machias.

Annual surveys indicate that juvenile clams are abundant in Hampton/Seabrook Harbor, but do not survive to adulthood. In order to identify a potential solution to this problem and to increase the number of harvestable clams, it is necessary to determine the cause of mortality. This study is focusing on predators, crowding, winterkill, disease and tidal height as possible factors in clam survival.

The fieldwork for the study will be completed by July 2002, and an analysis and conclusions will be presented in a final report by the end of the year.

Storm Drains & Water Quality in the Seacoast

During heavy rainfalls, bacteria and other pollutants can enter surface waters through runoff and combined sewer overflows (CSOs). Combined sewers are pipes that collect both stormwater and municipal wastewater. They may exceed their capacity during heavy rainfall events and the overflows transport untreated sewage into surface waters. In the Seacoast area, the City of Portsmouth has eliminated seven of its ten combined sewers. The city has devel-

oped a “CSO Long Term Control Plan,” which proposes approximately \$20 million in construction and sewer upgrade expenses over the next ten years. The plan is under review by EPA and DES.

Beginning in 1996, the identification and removal of illegal discharges of sewage to stormwater drains has been an on-going project of DES in the Seacoast area. Since that time, 41 individual discharges have been identified and eliminated. DES provides funding from the New Hampshire Estuaries Project to coastal municipalities to help eliminate illicit discharges to storm drain systems. In 2000, \$18,000 in assistance was granted to the cities of Portsmouth, Dover, and Rochester for this purpose.

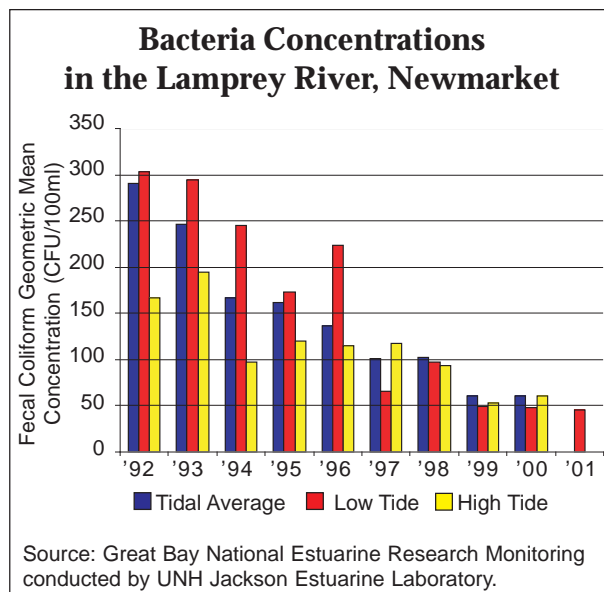
The elimination of CSOs and illicit connections will reduce bacteria inputs to the coastal watershed, which will have a positive impact on overall water quality, habitat, and recreation.

Bacteria Concentrations in the Lamprey River Improve

The UNH Jackson Estuarine Laboratory has monitored concentrations of fecal indicator bacteria in the tidal portion of the Lamprey River near Newmarket on a monthly basis since 1992. The average concentrations have steadily declined and have been reduced by 80 percent since 1992. The improving water quality is likely due to a combination at upgrades to the Newmarket wastewater treatment facility, elimination of illicit connections, and improvements to Newmarket’s sewer infrastructure. Lower bacteria concentrations in the tidal rivers like the Lamprey will be reflected in the water quality of the rest of the Great Bay Estuary, where many shellfishing areas are closed due to bacterial pollution.

Fish Consumption Advisory

In 2001, the N.H. Department of Health and Human Services expanded its fish consumption advisory to include ocean fish and shellfish due to contamination by mercury, PCBs and dioxins. To obtain a complete listing of New Hampshire fish consumption advisories, including 2001 changes to the freshwater fish advisories in New Hampshire call 1-800-852-3345 ext. 4664 or visit www.dhhs.state.nh.us/bhra



LAKES AND PONDS

Public Beach Monitoring Program

New Hampshire is blessed with some of the cleanest lakes in the nation and miles of beautiful coastline. Public beaches are one of the state’s favorite vacation destinations, generating significant revenue for the state economy.

Beachgoers must be assured that a visit to the beach won’t be followed by a visit to the doctor. They need to know that the waters in which they swim are safe. When waters do not meet public health standards, the public needs to be promptly and clearly notified. To meet this need, DES inspectors visit each public beach in the summer months to monitor beach quality and ensure that the beach is safe for swimming. During the 2001 season, approximately 200 public beaches were inspected and monitored for water quality.

On average, public health advisories are issued at eight to ten public beaches a year—less than 5 percent of the inspected beaches. However, in 2001 DES posted public health advisories for 23 freshwater beaches with no advisories issued for the coast. A possible reason for this increase may stem from the hot dry summer experienced throughout the northeast. Advisories are typically short-term, lasting from one to three days. Water contamination is primarily attributable to waterfowl, weather conditions, bathing beach configuration, and heavy beach use. New

Hampshire continues to be recognized by the National Resources Defense Council as having one of the top beach monitoring programs in the nation.

Malformed Frog Surveys

Frog lifecycle and physiology put them in very close contact with their surroundings, thus making them particularly susceptible to environmental disturbances. For this reason, the health of frogs and other amphibians may be a key environmental indicator. Since 1998, volunteers have collected and surveyed frogs from across New Hampshire. Of the 6,500 frogs collected to date, over 10 percent have been documented as abnormal because they had malformations, injuries, disease or showed evidence of parasites.



Malformed frog with missing digits on foreleg.

Only very subtle abnormalities had been observed in New Hampshire prior to 2000, when several frogs were found with multiple limbs or unusual bloating. Although the cause of the extra limbs is still unknown, the bloating has been linked to a Ranaviral infection, which is known to cause amphibian deaths around the world. In 2001, this virus was again documented in the wetlands where it was observed in 2000, and in two additional New Hampshire locations.

Exotic Species

Exotic aquatic species are plants or animals that are not part of New Hampshire's native flora or fauna. The first exotic aquatic plant infestation in New Hampshire was discovered in 1965 in Lake Winnepesaukee. Since then, the problem has increased to 56 infestations in 52 waterbodies. Problem species include variable milfoil (48 waterbodies), Eurasian milfoil (two waterbodies), fanwort (six waterbodies), water chestnut (one waterbody) and Brazilian elodea (one waterbody). Most of these exotic plants can propagate by fragmentation as well as by seed. Three new variable milfoil infestations and the Brazilian elodea infestation were discovered during 2001.

Exotic aquatic plant fragments can easily become attached to boats and motors, and are spread from waterbody to waterbody by transient boats and trailers. Infestations have detrimental impacts on the ecological, recreational, aesthetic, and economic values



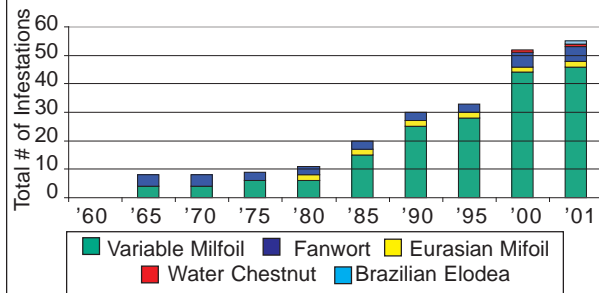
Exotic milfoil in Lake Massabesic, Manchester.

of the state's surface waters, and may result in limited use of the waterbodies, and decreased shorefront property values.

Many non-profit organizations including the New Hampshire Lakes Association and private lake associations participate in voluntary monitoring, education, and control efforts. Control measures for new, small infestations usually include hand pulling, installation of benthic barriers, and may include designation as a "Restricted Use Area." Larger, established infestations are usually controlled with herbicides. Project activities for 2001 included 20 herbicide applications, five benthic barrier installations, five hand-pulling activities, one harvesting experiment, and four restricted use area designations.

Research is a key element in the Exotic Aquatic Species Program. As variable milfoil is not a nuisance species in other parts of the country, little research has been conducted on the plant's biology, ecological relationships, and potential control strategies. By working with local colleges and universities, such as Dartmouth and the University of New Hampshire, as well as field-testing various hypotheses in New Hampshire waterbodies, DES is trying to find solutions to exotic aquatic plant infestations. In 2001, DES partnered with UNH to study the impact of milfoil

Annual Trends in Total Documented Exotic Aquatic Plant Infestations in N.H., 1960-2001



Source: NHDES Exotic Species Program, February 2001
(Note: Numbers denote numbers of infestations, *not* infested lakes.)

infestations on property values. UNH found that infestations can decrease lakefront property values by as much as 16 percent. Also in 2001, DES began collaborating with Dartmouth College on genetics research on the milfoil species in New Hampshire. The bulk of this study will take place in 2002.

RIVERS AND STREAMS

River Restoration through Dam Removal

The New Hampshire River Restoration Task Force, a public-private task force formed in 2000 for the purpose of removing obsolete dams, met its first milestone in July 2001, when the McGoldrick Dam on the Ashuelot River in Hinsdale was removed. The six-foot high, 150-foot long dam was constructed in the early 1800s, and provided local businesses with power for more than a century. At the time of its removal, it had outlived its usefulness and was in disrepair. The McGoldrick Dam removal is a key component of a larger plan to restore anadromous fish, including American shad, blueback herring and Atlantic salmon, to the Ashuelot River. Plans are in place to remove the upstream Winchester Dam in 2002. Also under consideration for removal is the Homestead Woolen Mill Dam in Swanzey. The removal of

With DES equipment operator John Collins at her side, Governor Shaheen operated the controls of a backhoe to take the first steps in breaching the McGoldrick Dam. The old impoundment was removed to create a free-flowing stretch of the Ashuelot River, allowing fish to again migrate upstream from the nearby Connecticut River.

these three dams, combined with planned fish passage installations on three functioning hydro dams, will restore the movement of fish to more than thirty river miles for the first time in nearly two hundred years.

The DES Dam Bureau now has a River Restoration Coordinator who assists dam owners, communities and others during the dam removal process. Interested dam owners should consult the new Standard Dam Removal Permit Application, available online at: www.des.state.nh.us/dam/applications.htm. DES can provide assistance in completing the application and in identifying potential funding sources to help defray the associated costs of dam removal.

WATERSHED MANAGEMENT/ HABITAT PROTECTION

Globally Rare Ecosystem Preserved

On Earth Day, 2001, Governor Jeanne Shaheen, joined by environmentalists and city, state, and federal officials, dedicated a 350-acre preserve at Hackett Hill. This site is one of the state's most significant ecological areas, and it was saved from development by an innovative public-private agreement.



“With the creation of the Hackett Hill Ecological Preserve, we have guaranteed that for generations to come, New Hampshire citizens will be able to enjoy, and learn from, this special and unique place,” Governor Shaheen said. “Few people know—or could imagine—that this environmental treasure exists in the heart of our state’s largest city. Our innovative collaboration ensures that it will be preserved forever for the people of the City of Manchester and the State of New Hampshire.”

The Hackett Hill Preserve was targeted for permanent protection because it contains globally rare Atlantic White Cedar and Black Gum swamps. It also includes the only known co-occurrence of Atlantic White Cedar trees and Great Rhododendron. The Preserve was transferred to The Nature Conservancy, which will manage the land to maintain its ecological integrity.

The Preserve was created as part of an agreement between the City of Manchester, DES, and the U.S. Environmental Protection Agency. The overall purpose of the agreement is to address Manchester’s combined sewer overflows (CSOs), which results in millions of gallons of sewage and stormwater being discharged into the Merrimack River each year.

Manchester was given additional time to address its CSO problem in exchange for working on several environmental initiatives including the preservation of Hackett Hill; a ten-year, \$52.4 million plan to remove the majority of the sewer overflows into the river; a program to reduce childhood lead poisoning and asthma; urban pond restoration; and investments in improving stormwater management along the river.

WETLANDS PROTECTION

Wetlands perform numerous functions and offer benefits valued by our society. The functions of the wetlands may be impaired and the benefits adversely affected when wetlands or surface waters are dredged or filled or when structures are built in or adjacent to those wetlands and waters. In 1967, a state law was enacted to protect the state’s tidal wetlands and tidal surface waters. In 1969, the same protection was extended to freshwater wetlands and surface water. The law, which is administered by DES, requires a permit for dredge, fill, or construction of

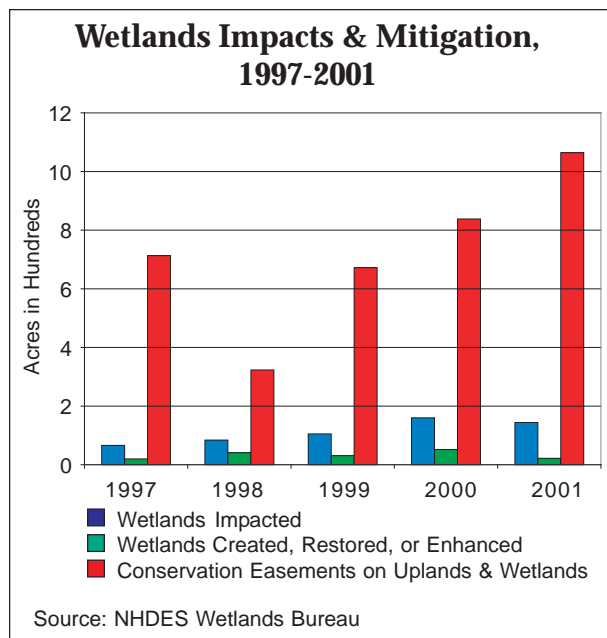
structures in wetlands or other waters of the state. The law also provides protection of sand dunes and upland tidal buffer zones.

New Hampshire has approximately 400,000 to 600,000 acres of nontidal and tidal wetlands—about



6 to 10 percent of the land area of the state. Approximately 6,200 acres of this total are salt marshes. These wetlands protect the quality of our surface waters, acting as filters by utilizing excess nutrients and preventing them from entering waterways. They store runoff from upland areas and release it slowly, which results in a reduction of peak flood flows. Since they often serve as recharge and discharge areas for groundwater, they may also maintain in-stream flows during dry periods.

Estuarine and coastal marshes are among the most productive areas in the world, serving as nurseries for finfish and shellfish. Wetlands of all types provide habitat for a wide variety of wildlife, and are important to more than half of the rare, threatened or endangered plant and animal species in New Hampshire. Vernal pools, which are temporarily flooded basins within forests, are the breeding habitat for a wide variety of amphibian species. Many species of birds, mammals and reptiles depend on wetlands as a significant portion of their habitat, using them for feeding, reproduction, or refuge. Deer congregate in wetlands during hard winters because they generally contain the last open water and forage.



Sprawl and Wetlands Mitigation

New Hampshire's wetlands protection strategies continue to evolve to ensure that these valuable resources will continue to function in the future. During the high growth period between 1997 to 2001, more than 550 acres of wetlands were lost due to permitted activities. Much of this loss is associated with increased sprawl, a pattern of land use characterized by scattered, low-density development, which results in fragmentation and loss of open space. DES is working with the N.H. Office of State Planning and others on "smart growth" planning efforts designed to redirect growth in planned and environmentally friendly directions.

Wetlands lost to development were partially offset by the creation or restoration of 166 acres of wetlands, but more importantly, conservation easements have been placed on 3,600 acres of adjacent uplands and wetlands to protect the functions and values of the wetland-upland ecosystem. DES is developing mitigation rules that will assure a consistent application of compensation for unavoidable losses of wetlands.

Wetlands Permit Program Streamlined; Backlogs Reduced

In 2001, DES received 2,180 applications for impacts to wetlands and surface waters, and it is an on-

going challenge for DES to review these applications in a timely manner. It is essential that we continue to focus on simplifying the permitting process and reducing review time permitting and on compliance issues. The effectiveness of this program must be improved through more timely action from DES and greater public understanding of the importance of wetlands protection.

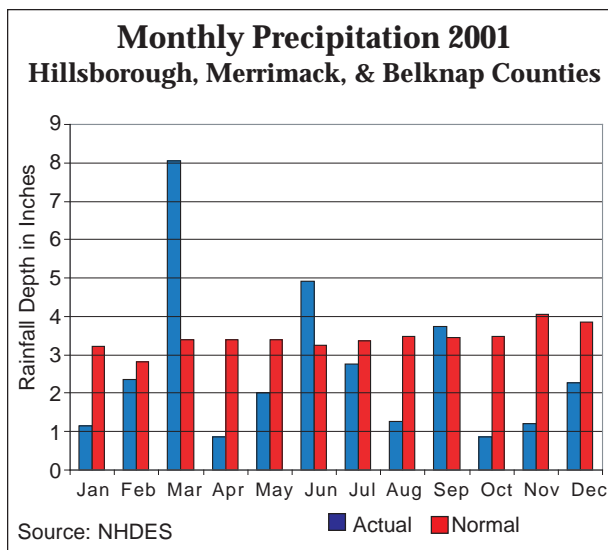
To streamline wetlands permitting, new DES rules were recently adopted establishing a permit-by-notification process for minimum impact seasonal docks. Also, DES is simplifying the permitting process for routine highway and railway maintenance and for culverts and bridge maintenance work. Moreover, DES adopted new streamlined rules for breakwaters, and recently-proposed DES "lifetime maintenance" rules will allow the maintenance of same-ownership structures without the need for a new wetlands permit.

DES takes seriously its responsibility to educate the public, conducting many outreach activities. These activities serve a full range of people—from professionals in the land development sector to municipal conservation commissions to the general public. In 2001, the DES Wetlands Bureau reached almost 5,000 people through more than forty events and workshops across the state.

WATER AVAILABILITY

By the end of the year of 2001, New Hampshire was in the midst of one of its worst droughts on record, exceeded only by the droughts of 1965-66 and 1941-42. For the year, rainfall was approximately 80 percent of normal, but was only approximately 50 percent of normal over the last four months of the year. As a result, groundwater fell to levels well below normal, and record low levels were measured at many of the state's groundwater monitoring wells. The drought also caused streamflows in the river basins in New Hampshire to fall to a fraction of normal, and new low streamflow records were set at many stream gauge sites throughout the state. Residents who obtain their drinking water from shallow, dug wellswere the most seriously impacted.

In November, the state's Drought Management Team (representing several state agencies, including DES, and industrial, municipal, and water works



associations) issued a drought warning for the entire state, urging residents to implement voluntary water conservation measures. A drought warning is the second of four drought notification levels specified in New Hampshire's Drought Management Plan, the first being alert, the third, emergency, and the fourth, disaster. The entire state remained in a drought warning status at the end of 2001.

The 2001 drought also further raised the public understanding of an increasing problem in New Hampshire—the potential long term stress placed on New Hampshire's water resources by decades of continuous growth. This is particularly evident in Southern New Hampshire where, for example, moratoriums on outdoor water use regularly occur in a number of municipalities due to limitations on the available water quantity. Furthermore, the need to balance proposed withdrawals with potentially competing uses, including the preservation of sensitive environments and other water users has been well-recognized by New Hampshire's residents and legislature. These concerns are now being widely discussed. New Hampshire has entered an era during which technical analysis, planning and policy discussions will need to occur at the local, regional, and statewide levels to ensure that adequate water quantity is available, and the right balance is achieved between competing demands, to ensure a sustainable economy, quality of life, and environmental protection into the future.

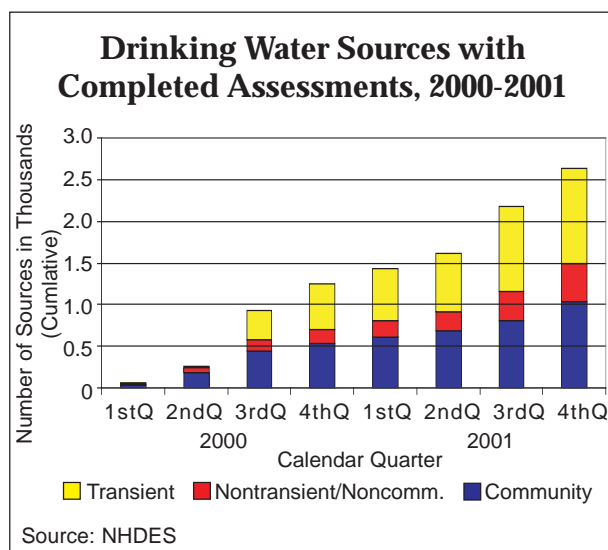
DRINKING WATER

Water Supply Land Conservation Program

In its first full year of operation, DES's Water Supply Land Conservation Program provided \$1.3 million in grants to four communities to protect 1,911 acres surrounding public drinking water sources. The program, created in 2000, provides 25 percent of the costs for towns to acquire lands or protective easements in order to ensure the long-term protection of public drinking water supplies. The projects funded in 2001 ranged in size from a 45-acre parcel in Raymond to a 1,378 acre project encompassing the headwaters of the Bellamy and Oyster Rivers.

Assessing Threats to Drinking Water Sources

DES has been operating its Wellhead Protection Program since 1991, but the department has never had a complete picture of the contamination threats that could potentially affect the state's approximately 3,000 public water supply sources. However, when the 1996 Amendments to the Federal Safe Drinking Water Act required states to develop Source Water Assessment Programs, DES found itself well-positioned to meet the new mandate in a manner that encouraged direct involvement by water suppliers in the implementation of improved protection programs. Aided by its advanced geographic information system (GIS), and the high participation rate of water suppliers in the Wellhead Protection Program, New Hampshire was one of the first states to gain EPA's approval of its Drinking Water Source Assess-



ment Program (DWSAP) in 1999.

DES has also made rapid progress in completing the assessments. Working under a statutory deadline of May 2003, DES had completed assessments of 87 percent of the state's public water supply sources by the end of 2001. The results of all of the completed assessments are on DES's website at www.des.state.nh.us/dwspp/reports.htm.

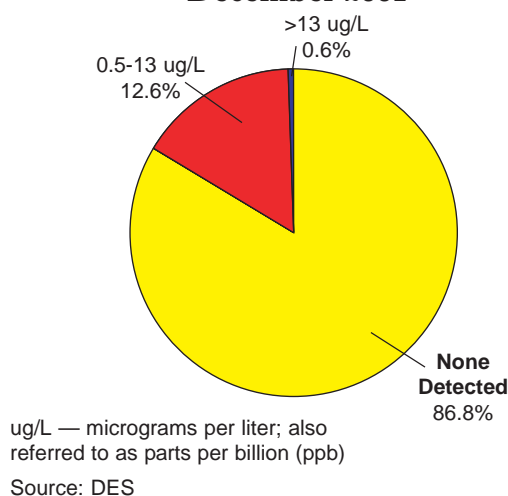
Each Source Assessment Report contains a map of the source protection area (the wellhead protection area for a well or the watershed for a surface source); an inventory of potential contamination sources (PCSs) in that area; and a table indicating a low, medium, or high vulnerability rating for each of nine to thirteen criteria. Examples of PCSs are manufacturing facilities, commercial septic systems, vehicle repair shops, agriculture chemicals application areas, and petroleum and hazardous waste storage areas. Vulnerability ratings are based on a combination of GIS-based information and on-the-ground surveys of land uses. The assessment reports also include information about the nature of the threat posed by each PCS and an overview of measures that can be implemented on the local level to better protect each water supply source.

The ultimate goal of the Drinking Water Source Assessment Program is to encourage improved source protection by better informing water suppliers and the public about the potential threats facing their drinking water sources. The assessments will also help DES better direct its outreach and assistance efforts to address those areas at greatest risk.

MtBE Contamination

Methyl tertiary-Butyl Ether (MtBE) is a fuel additive used in reformulated gasoline to improve combustion efficiency, reduce emissions of carbon monoxide and volatile organic compounds, and enhance octane. It is referred to as an oxygenate because it adds oxygen to the fuel, thereby improving combustion efficiency. Unfortunately, MtBE is also highly soluble and migrates readily in water. As a result of underground storage tank leaks, gasoline spills, and improper use and disposal of gasoline, MtBE has found its way into public and private water supplies. As of December 2001, 149 public water supplies, 13.2 percent of the public water supplies in the state, had

MtBE Detected in N.H. Monitored Public Water Systems, December 2001



some level of MtBE present in the drinking water. The vast majority were in the range of 0.5 to 5 parts per billion (ppb), well below the state health standard of 13 ppb.

In 2001, New Hampshire submitted to the U.S. Environmental Protection Agency a formal request for an accelerated opt-out of the federal Reformulated Gasoline program and to participate in efforts to develop a regional or federal approach to reduce the threat of MtBE contamination.

Also, in June the Governor signed into law House Bill 758 establishing the Gasoline Remediation and Elimination of Ethers Fund, referred to as "GREEF." This fund provides assistance to private and public water supplies that have MtBE contamination, from unknown sources, at or above the state's 13 ppb health standard. The fund will pay for the installation and operation of treatment systems to remove gasoline ethers from drinking water. For the period of July 1 to December 31, 2001, seven treatment systems were installed in five communities throughout the state at a cost of over \$36,000.

Although MtBE is the most widely used gasoline oxygenate in the state, gasoline manufacturers use other oxygenates as well. These include tertiary amyl methyl ether (TAME), di-isopropyl ether (DIPE), ethyl tertiary-butyl ether (EtBE), and tertiary butyl alcohol (TBA). Beginning in 2001, DES required

New Arsenic Standard Adopted

In January 2002, DES adopted the federal public drinking water standard for arsenic of 10 parts per billion (ppb). This is a significant tightening of the current standard of 50 ppb. The more stringent standard will become effective on January 22, 2004 and will apply to community water systems (for example, municipal systems, apartment buildings, and mobile home parks) and non-transient non-community public water systems (for example, businesses, schools and day care centers). New water systems that begin operation after January 22, 2004 will be required to immediately comply with the new standard. However, existing public water systems will have until January 22, 2006 to comply. Of the 1,147 existing community and non-transient non-community public water systems, it is estimated that 105 will need to take corrective action to meet the new standard.

all sampling at petroleum contaminated sites to report the presence of these other gasoline additives. DES has also requested the N.H. Department of Health and Human Services to evaluate the need to establish drinking water standards for each of these compounds to ensure protection of the public health.

Private Well Testing Urged

Approximately 35 percent of New Hampshire's population (about 425,000 people) obtain their drinking water from private residential wells. These wells are largely unregulated, in contrast to public water supplies that are subject to the rigorous standards established in the federal and state Safe Drinking Water Acts. As a result, water from private residential wells is usually not sampled on a regular basis, and when it is, (such as when a property is sold) the analyses do not typically include all the potential contaminants of concern.

Naturally-occurring contaminants in New Hampshire's well water include arsenic, radon and other radionuclides. Other potential contaminants are a result of human activities and include lead and copper from plumbing, pesticides and nitrates from landscaping and agricultural activities, industrial solvents, petroleum products and fuel additives such

as benzene, toluene, and methyl-t-butyl ether (MtBE). The lack of routine comprehensive analyses of private wells means that many consumers are unaware that their drinking water may contain elevated levels of these contaminants. Consequently, the water can go untreated, placing public health at risk.

In order to improve public awareness of the need to conduct regular sampling of private wells, DES has embarked on a campaign involving the development of radio public service announcements, flyers and displays, and outreach to professional and trade groups such as bankers, home inspectors, real estate agents, well drillers and municipal officials. For information on private well testing, visit DES's web site at www.des.state.nh.us/well_testing.htm.

WASTEWATER MANAGEMENT

Wastewater treatment plays an important role in maintaining the quality of the state's waters. Much progress has been made, especially since passage of the 1972 federal Clean Water Act. This law required that wastewater from industries and municipal collection systems be treated prior to discharge into surface waters, and it funded the construction of many treatment plants nationwide.

Here in New Hampshire, over 80 wastewater treatment facilities have been built or upgraded, using federal, state and local dollars. In the past several decades, \$846 million in federal and state grants have been awarded. Since the creation of a State Revolving Loan Fund in 1991, \$174 million has been loaned for wastewater treatment projects. This has resulted in dramatic improvements to the water quality of New Hampshire's rivers and lakes.

Managing Sludge, Biosolids, & Septage

Currently, New Hampshire generates about 88,000 wet tons of municipal sludge annually. Sludge is the solid or semi-solid material produced by water and wastewater treatment processes. DES estimates that about 34 percent of this amount is incinerated by the City of Manchester; 21 percent is buried at three New Hampshire landfills; 23 percent is converted to Class A compost, having no detectable pathogens; and about 22 percent is land applied as Class B biosolids. Class B biosolids may have detectable pathogens, but at levels that do not threaten

Epping Pursues Wastewater Improvements

Improvements and upgrades are periodically conducted at wastewater treatment facilities statewide. One recent example is wastewater treatment improvements in the Town of Epping, improvements which benefit the Lamprey River, a recently-designated “Wild and Scenic River”



under the National Wild and Scenic Rivers Act. The town is now constructing a new 500,000-gallon per day wastewater

treatment plant, which will provide state-of-the-art advanced treatment of municipal wastewater prior to discharge to the river. The plant is scheduled to meet new stringent discharge limitations required by EPA by September 1, 2002.

The construction project includes installation of new headworks facilities, grit removal equipment, a patented Zenon microfiltration process, process buildings, removal of sludge from the lagoon, and an ultraviolet light disinfection system. Designers are confident that the new facilities will reduce pollutant levels of suspended solids and ammonia. An aerated cascade will boost effluent dissolved oxygen to ambient levels prior to discharge to the river.

The need for these improvements is highlighted by intensive stream studies and computer modeling completed by DES in the mid-1990s. Those studies concluded that stringent pollution controls were necessary in Epping to ensure year-round water quality protection of the Lamprey River downstream of the town. Town officials worked closely with the Lamprey River Watershed Association throughout the facility's planning and permit process.

The project is funded in part by an EPA special appropriations grant. The special grant, together with a 20 percent State Aid Grant, will pay for most of the estimated \$4.7 million total project cost.

public health or the environment.

Several facilities have shifted from reliance on land application of Class B biosolids to less regulated Class A compost, or out-of-state disposal. Once certified as Class A, compost can be used in a wide variety of ways, including landscaping, gardening, beautification projects, cemeteries, and along roadways. The Town of Plymouth has been composting its sludge for 20 years. It operates a small in-vessel system, and currently accepts sludge from the town of Bristol. This high quality compost is available for local use, with a portion returned to Bristol.

Most new housing relies on septic systems, thus increasing the amount of septage needing to be pumped and disposed. Over 77 million gallons of septage is pumped annually. Statewide septage disposal capacity at in-state facilities has not kept pace with population growth, and capacity has actually decreased in recent years. New Hampshire increasingly relies on neighboring states to treat its septage, and there has been a seven-fold increase in this exportation between 1996 and 2000. During this same period there was a doubling of the amount of septage disposed in unlined lagoons, but only a moderate increase in the amount land applied. One of the more striking and positive shifts has been the increasing reliance on innovative solutions for septage treatment and disposal, including artificial wetlands treatment systems and solar aquatic technology (see next page).

A task force convened by DES in 1999 has made a number of recommendations for addressing the septage disposal crises. It is anticipated that this will lead to new or expanded local, state-owned, and/or regional septage facilities and should help to address the septage capability shortfall.

SOLAR AQUATICS: AN INNOVATIVE SEPTAGE TREATMENT FACILITY IN WEARE

Septage volumes are increasing in New Hampshire by an average of over five million gallons per year. Existing wastewater treatment facilities have limited capacity to treat both domestic wastewater and septage. Alternative and innovative solutions are being developed to meet this rising demand. One of these is a solar aquatic septage treatment facility in Weare.

The 5,000 gallons per day processing facility involves screening, degritting, aerated equalization and blending tanks, primary clarification, aquaculture treatment, secondary clarification, wetlands treatment and sludge storage/processing in a reed bed. The final sludge is land applied on-site, and the final clarified effluent is disposed by infiltration. Monitoring wells have been installed to analyze any effects on groundwater.

The most impressive component of this innovative system involves the assembly of solar aquatic tanks and wetlands marshes enclosed in a greenhouse. There are four parallel treatment trains, each consisting of six tanks. In effect, each tank and the marsh is a complex ecosystem relying on a large diversity of bacteria, algae, zooplankton, phytoplankton, higher plants, snails, and other living organisms. The clarified septage passes from tank to tank and organic constituents become food to the many organisms. After a relatively short time, much of the organic mass is converted to carbon dioxide, water and energy. The portion that is converted to animal and vegetative



Solar aquatic tanks and wetlands marshes within a greenhouse in Weare—an innovative treatment process.

growth in the columns is periodically harvested and composted on site. While this biotic system has been effectively treating over 1.3 million gallons of septage per year from Weare and surrounding towns, it does have a higher total cost when compared with other more traditional methods such as lagoons or conventional wastewater treatment. To duplicate such a facility elsewhere in the state would entail significant capital costs, and the facility must be operated by someone knowledgeable about biological systems and septage handling. Nevertheless, the solar aquatics facility in Weare has proven that the concept can work in colder climates.

N.H. Geological Survey Formally Created

In 2001, New Hampshire became the most recent state to have a formal state geological survey or geologic bureau within its state government. This formal recognition is designed to enhance data collection and management of the state's natural resources, particularly in the critical area of groundwater resources.

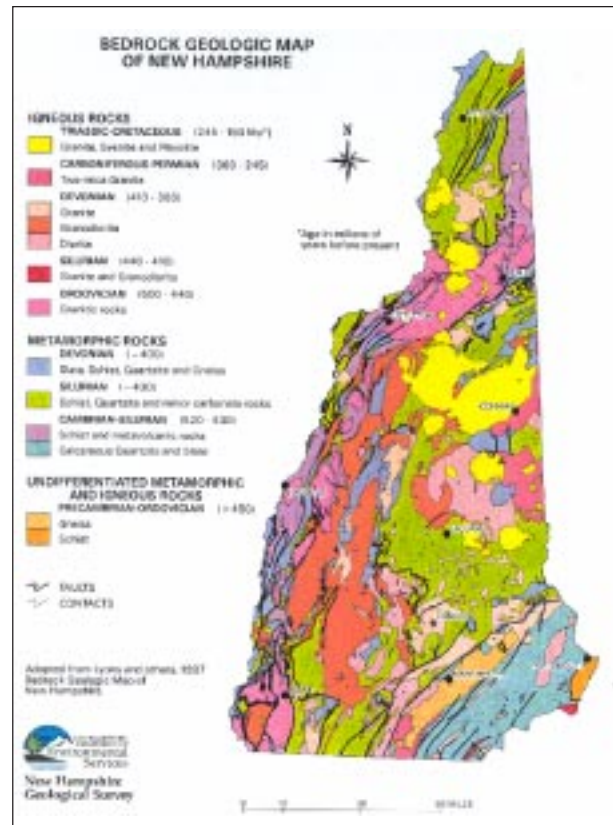
The new unit, which was created when House Bill 245 was signed into law, "shall collect data and perform research on the land, mineral, and water resources of the state, and disseminate the findings of such research to the public through maps, reports, and other publications."

Coinciding with the establishment of the New Hampshire Geological Survey (NHGS), the staff of DES's Water Management Section was merged with the State Geologist's office and now functions as the NHGS staff. Thus, the NHGS staff will maintain its role of collecting and managing water well construction and water use data, managing the state's water-level monitoring network, and providing other related information.

One of the goals of the new unit is to enhance



State Geologist David Wunsch (second from left) joins colleagues in reviewing new maps depicting the bedrock geology of the White Mountains region.



accessibility for both staff and public to the DES water well database. In addition, there is a wealth of hydrogeologic information contained in DES records that will be utilized to create useful publications such as depth-to-bedrock maps, and produce statistical analyses of well data to better delineate hydrogeological and geochemical anomalies, such as arsenic, radon, fluoride, and salt water problems.

The *Statemap* geological mapping program continues to map the surficial deposits at the 1:24,000 scale, making the data available as seamless digital layers that can be used through the DES *One-Stop* and *Granit* databases.

For more information about the New Hampshire Geological Survey, please call (603) 271-6482. The NHGS has over one hundred publications pertaining to New Hampshire's geology. For a complete listing, please go to www.des.state.nh.us/geo1link.htm, or call the DES Public Information Center at (603) 271-2975.

Volunteers Can Make A Difference

To measure the health of our waters and to learn how to protect them, there are several programs at DES that provide training, monitoring equipment, and data interpretation for local volunteers. The N.H. Volunteer River Assessment Program (VRAP), the NH Volunteer Lake Assessment Program (VLAP), and Weed Watchers are several examples of DES programs that train volunteers to collect valuable information about New Hampshire waters. These monitoring efforts help answer such questions as: How clean are our waters? How are our lakes and rivers changing? What should be done to protect our water quality? Volunteer water quality monitoring of lakes and rivers typically runs from June to August and can continue into October. For more information, contact DES at 271-3503 or visit DES's website at www.des.state.nh.us.

Across New Hampshire, volunteers trained by DES staff are helping to monitor and protect the state's natural resources. Here, participants in DES's VLAP program use a Kemmerer bottle to sample lake water. Their efforts serve to profile and track the quality of this waterbody by providing valuable data.



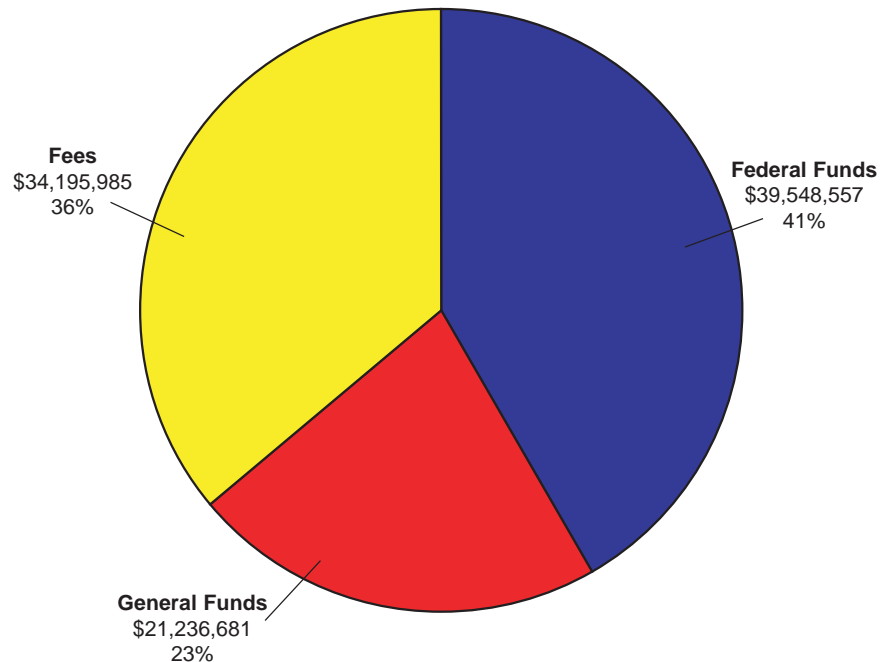
Environmental Dollars at Work

DES Financial Data, Fiscal Year 2001

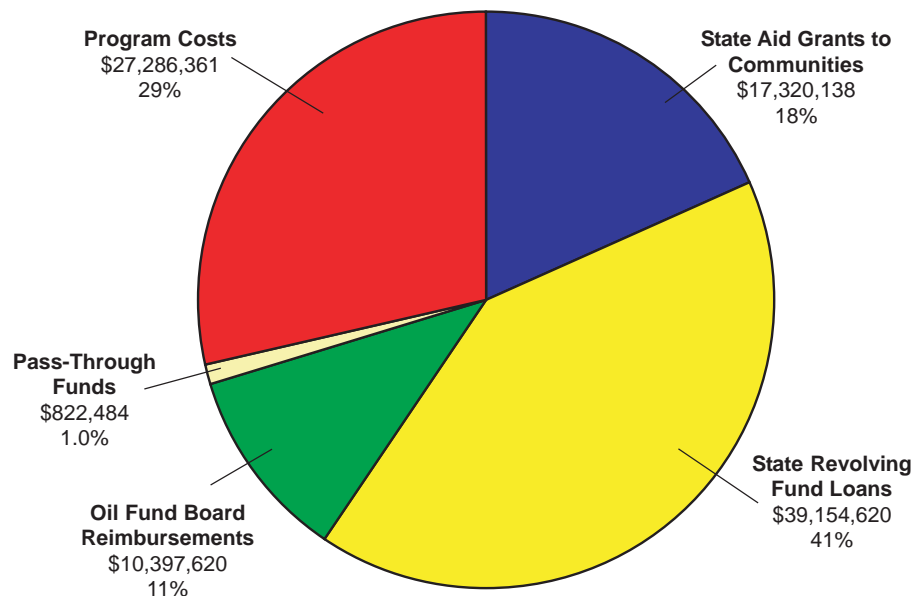
DES relies upon a variety of funding sources to carry out its mission of protecting and restoring New Hampshire's environment. As the top graph illustrates, a large portion of DES's budget comes from the federal government – 41 percent. This is followed closely by program fees, which account for 36 percent of the budget. The remaining income sources are State general funds and capital budget money.

How these funds are allocated, as shown in the lower graph, reflects DES's commitment toward working cooperatively with others. Of its \$95 million in expenditures, over 70 percent, or approximately \$67.5 million dollars, comes into DES and goes right back out in the form of grants, revolving loans, and reimbursements to communities and others. Through such investments, the State of New Hampshire supports the involvement and efforts of many people across the state, which is vitally needed to continue to improve the quality of our environment.

FUND SOURCES
Total Income \$94,981,223



USE OF FUNDS
Total Expenditures \$94,981,223



Credits & Acknowledgments

Special thanks goes to the many employees throughout DES who gathered information, wrote text, and created charts for this report.

Project Managers

Charles Knox

Vincent Perelli

Division Coordinators

Barbara Fales

Philip O'Brien

Wendy Waskin

Editor

Charles Knox

Layout and Design

Patricia H. Gruttemeyer

Photographs

Charles Knox, DES, cover, pp. 1, 2, 9, 10, 11, 12, 13, 14 (landfill), 16, 19 (ceremony), 21, 25, 26, 33; Leo Traverse, Hazmat, p. 14 (household hazardous waste collection); Pierce Rigrod, DES, p. 15; Paul Lincoln, DES, p. 17; Carroll Brown, DES, p. 18; Mike Wimsatt, DES, p. 19 (Whitney Screw Co.); Natalie Landry, DES, p. 22; Laura Eaton-Poole, U.S. Fish & Wildlife Service, p. 24 (frog); Amy Smagula, DES, p. 24 (milfoil); Robert Phillips, All Clear Solar Aquatics Septage Treatment Facility, p. 32; and Amy Smagula, DES, p. 34.

Except where noted otherwise, the source for all charts is the New Hampshire Department of Environmental Services.

(*New Hampshire Environment 2001* was published on 100% post-consumer recycled, process chlorine-free paper.)

FOR MORE INFORMATION

If you wish further information on topics discussed in this report, please contact DES's Public Information Center at (603) 271-2975 or visit DES's website at www.des.state.nh.us.

N.H. Department of Environmental Services

6 Hazen Drive

PO Box 95

Concord, NH 03302-0095

(603) 271-3503

TDD Access: Relay NH 1-800-735-2964